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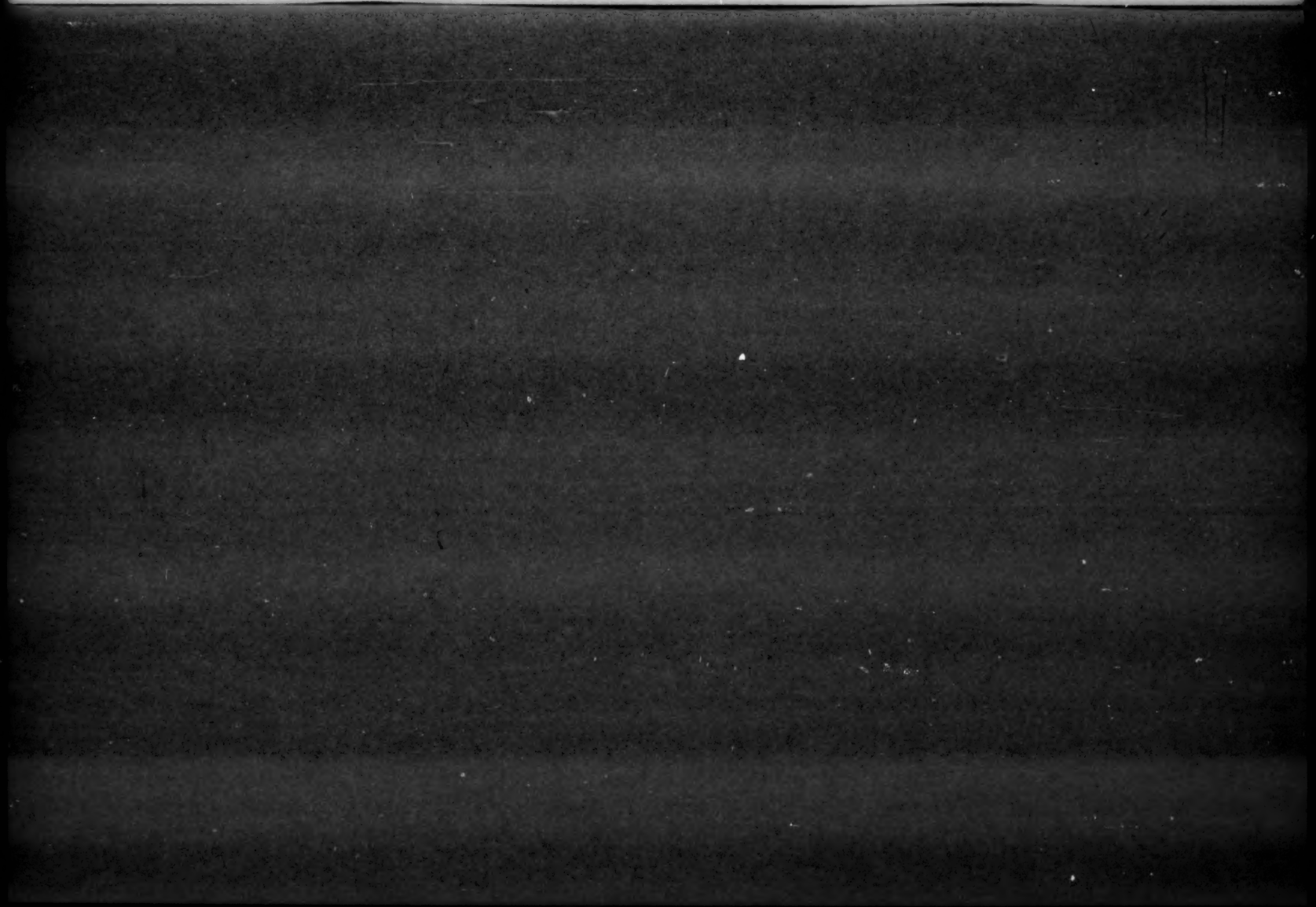

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THE DEVELOPMENT AND STATUS OF GEOGRAPHY IN UNIVERSITIES AND GOVERNMENT IN CANADA.*

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As the first Canadian president of the Association of Pacific Coast Geographers this would seem to be the proper occasion on which to discuss the place of geography in Canada. In doing so I have two purposes in mind. First, is that of describing what geographers are doing in Canada and of describing their progress in the establishment of the subject in the universities and several branches of government. Second, is the opportunity to offer this summary as a comparison with the development and utilization of geography in the various parts of western United States. While I pay tribute to these men as pioneers in the development of geography in Canada, I am more interested in their work, and the trends which they have established, than in the names themselves.

The emergence of geography on a professional level is a recent development in Canada. Although geography was taught in the primary and secondary schools in the last century, and geography text-books have been written by Canadian teachers, it has been relatively recently that geography was introduced into the Arts programs of Universities. There is not space to discuss the place of geography in the secondary and primary school systems for that is a separate study in itself. It is apparent, however, that geography is generally missing or poorly taught in the schools in proportion to the amount and kind of geography given in the various provincial universities. In this respect Canadian education has been far behind developments in European universities, and also behind the United States which recognized the importance of geography early in this century. Much of the pattern and progress of Canadian geography has followed, on a smaller scale, that of geography in the United States.

Origins in the Universities

The first record of a geography course in a Canadian university is that listed in the curriculum of the University of New Brunswick at its inauguration in 1800. The course covered the general field of earth or physical science. When the course disappeared, and what influences or effects it may have had are not known.

The province of Quebec has been a pioneer and leader in modern Canadian geography. This is chiefly because education in French-Canada is modelled after the European system where geography is a normal part of a general education. The first recorded chair of geography was at the School of Higher Commercial Studies (affiliated with the University of Montreal) in 1910. The first professor was Henry Laureys. In the next decade the staff was expanded but geography never reached the status of a department. Throughout the following years geography remained as an important part of the commercial training of these students who went out into the Quebec business world. Benoit Brouillette, one of the modern leaders of geography in French-Canada, came to the School of Higher Commercial Studies in 1931. Last summer Dr. Brouillette was in charge of the UNESCO Seminar on the "Teaching of Geography," held in Montreal. At present he is on loan to UNESCO in Paris. All of the early Quebec

*Presidential address of the Association of Pacific Coast Geographers, Los Angeles, California, June 21, 1951.

geographers were trained in established departments of geography in universities in France before returning to teaching in Canada. The influence of the classical French geographers who were world leaders in the early part of this century has been strong in the development of geography in Quebec.

Geography expanded into the other faculties of the University of Montreal after World War I. (The Quebec university system is different from that of the rest of Canada. Most of the faculties, although affiliated with the University of Montreal, are virtually self-contained and separate colleges.) Courses were established in the Faculty of Social Sciences in 1921. The first professor was French-trained Emile Miller, who had written several books on physical and human geography. A promising career ended prematurely when he drowned in 1926. Courses were continued by a famous visiting French professor, the human geographer Jean Bruhnes, who gave lectures in 1925-27. It was during this period that two young Canadians were stimulated to continue graduate work in geography in France. They were Raymond Tanghe and Benoit Brouillette. The former returned to the University of Montreal about 1929 as professor of human geography, and later became Head Librarian of the University. The latter went to the School of Higher Commercial Studies in 1931, as previously noted. Geography at the University of Montreal was strengthened by annual visits (1929-38, 1945-49) from another noted French geographer, Raoul Blanchard. His three volumes on the geography of Quebec are standard reference works, and his influence as a teacher has been spread throughout the schools of Quebec by his students.

Thus, prior to World War II geography was well established in two main faculties of Quebec's largest university. Instruction was given by six staff members to undergraduates, but there was no graduate work. Geography was not considered as a profession, but as a part of a general education for business men, and other educated French-Canadians. Geography was also taught in the school system and therefore was not strange when students came to university.

The University of British Columbia was the first university to give geography partial departmental status. When the University opened in 1915 a course in Physical Geography was offered in the Department of Geology and Mineralogy. Although this course was strongly geological, like much of the geography of that period in North America, it did deal with world distributions of certain physical phenomena. The department introduced a course in Meteorology and Climatology in 1920, which has been taught continuously since that time. In 1922 the name of the department was changed to that of Geology and Geography. The course in Principles of Geography was presented by the head of the Department, later Dean of the Faculty of Applied Science, R. W. Brock. Brock's wide travels and broad outlook meant that a course covering the general principles of physical, human and economic geography was given to the students. In later years a few other geography courses, taught by one or more of the geologists on the staff, were added to the departmental curriculum. The development of geography was primarily in the physical, or earth science, field at the University of British Columbia since it was taught in a science department. However, both Brock and his successor in 1935, M. Y. Williams, had a broad interest in all earth phenomena, and geography's place in a general Arts education was not overlooked. After 1936 most of the geography courses were consolidated under N. F. G. Davis, who was an active member of this Association until his tragic death in 1942.

In summary, until 1935 geography in Canadian universities was taught essentially by geographers in Montreal and geologists in Vancouver. The exceptions were isolated courses, usually in economic geography, which were given in some years, notably in the Ontario universities of Toronto, Queen's, McMaster, and Western Ontario. At Toronto, for example, Economic Geography had been taught as early as 1906. At each of the other universities courses in commercial or economic geography were given in 1920 and in most succeeding years, but not by geographers.

Pre-war and War-time Expansion

In 1935 the University of Toronto appointed Dr. Griffith Taylor to give geography lectures. Taylor already had a notable record of achievement as a geographer at the University of Chicago and University of Sydney, Australia. In 1936 the first full department of geography in Canada was established at Toronto. In 1940 the Honours course in geography was started, and graduate students were accepted. Toronto, therefore, became the first university in Canada to begin serious training of geographers. Since there were no outlets in government service at that time, most of the students took geography as part of an Arts course and went back into the teaching field in the secondary schools. In 1944 the first Ph. D. in geography was given to Chun-Fen Lee, and next year the second degree went to J. Wreford Watson, then lecturing at McMaster University. Neither of these men was a native-born Canadian.

The teaching of geography in Canada began to expand in the universities prior to World War II. In 1938, a geography lectureship was established in the Department of Geology at the University of Western Ontario, in London, Ontario. Courses were given by Edward G. Pleva, American-trained geographer, from the University of Minnesota. In 1939, McMaster University in Hamilton, Ontario, brought in a full-time geographer to expand the geography offerings of that university. Courses were given by J. Wreford Watson, trained in Great Britain. At both Western and McMaster the subject soon became an established part of the general Arts curriculum, and enrollments in geography courses increased. At McMaster, in 1942, a separate department of Geography was created, the second full department in Canada.

Prior to 1940, therefore, geographers had been appointed at three Ontario universities, and the subject was becoming known in university education. Outside of the two most populated provinces of Quebec (previously discussed) and Ontario, there were no geographers, and within these provinces no graduate degrees had yet been granted to geography students.

Post-war Expansion

World War II proved the value of geography training in many branches of the Allied Forces Armed Services and in various Allied governments. It also pointed out the lack of trained geographers in Canada, compared with other countries. The awareness of this deficiency, plus the increasing emphasis upon "world understanding" which came with the post-war attempts to "win the peace," and the need for more and better knowledge of the world and its peoples in education fields, were among the reasons for the encouragement of geography after World War II. New departments were established and old departments were expanded.

McGill University in Montreal inaugurated the third Canadian geography department in 1945, headed by George H. T. Kimble from Great

Britain. Courses were expanded with the addition in 1946, of F. Kenneth Hare from England, and J. Ross Mackay, a Canadian with American training in geography. During the summer of 1947 the unique McGill Summer School of Geography was opened at Stanstead, Quebec. This school brought in outstanding geography lecturers, particularly from the United States and Great Britain, and emphasis was given to Arctic courses. In 1950 Kimble became Director of the American Geographical Society, New York, and F. Kenneth Hare succeeded as chairman of the department. Kimble's policy had been to maintain geography as a strong component of the Social Studies field. Several courses were designed to give the general Arts student a broad understanding of the geographic basis of world problems. In addition specialized training was given in Meteorology and Arctic Studies. The latter were aided by the establishment of the headquarters of the Arctic Institute of North America on the McGill campus.

At the University of Montreal geography expanded in 1945 when courses were given in the Faculty of Lettres -- the third faculty to have geography. In 1947 a department was finally established under the name of the "Institute of Geography," headed by Pierre Dagenais. Thus the university which had been a leader in geography education finally fully recognized the position of the subject in the university organization. The staff included B. Brouillette, R. Blanchard (visiting professor), and several guest lecturers from other faculties of the university and from McGill University. The Institute began granting the Ph. D. degree in geography for notable research and contributions to the field of geography. The first three degrees granted went to G. Kimble, J. R. Mackay and F. K. Hare, all of the McGill department of geography.

At Laval University, the second leading French-speaking university, in Quebec City, geography had been taught by B. Brouillette as guest professor for a few years prior to World War II. In 1947 an Institute of Geography and History was established. The two geography courses were given in 1948 by a guest professor, Pierre Deffontaines, widely-travelled French geographer. In 1949 the courses were taken over by Pierre Biays, geographer from Nantes, France. His appointment continued the pattern of liaison between geographers in Quebec and France. This policy, which is characteristic of French-Canadian universities, has little parallel in other activities in Quebec.

Geography lecturers who had been teaching prior to World War II added to their staffs and courses as university enrollments in Canada expanded with the flood of returning veterans. At University of Toronto, increasing numbers and genuine interest in geography meant that more lecturers were needed to handle the growing classes which numbered over 1,000 geography enrollments in 1947-49. By this time Canadian-born geographers were becoming available for teaching appointments. Several of these young men had received their undergraduate training in Canada and continued into graduate work in the United States. Syracuse University, in particular, has trained a number of Canadian geographers. Four instructors were added to the Toronto staff in 1945-47. Toronto thus maintained its leading position as the largest geography department in Canada, both in teaching staff and numbers of Honours and graduate students. Their fall field camp under the direction of Donald Putnam (which is also attended by McMaster University geography students) gives field experience and training which is generally not available at other Canadian universities. In 1950 the department granted its third Ph. D. degree to Donald Kerr, and in 1951 the fourth doctorate went to William Wonders. In July, 1951, Griffith Taylor retired as head of the department and could look back on an excellent record

of helping to establish geography in Canada. George Tatham and Donald Putnam became joint heads of the department for 1951-52. Taylor's retirement meant that there are no longer any elderly geographers in Canada. Departmental heads are in their thirties and forties -- a fact which emphasizes the youth of the subject in Canada.

By 1950 it had become possible for young Canadians to remain in Canada for post-graduate work. Six universities were granting the M. A. in geography and three universities were carrying students to the Ph. D. Although many Canadians still looked to the United States for graduate training, they have found there a lack of knowledge and experience in Canadian geography which can be a handicap upon return to Canadian positions.

Typical of the post-war expansion in geography departments in Eastern Canada, McMaster and Western Ontario also added new staff from the young geographers trained during the war. McMaster's expansion was curtailed in 1949 when the department lost its chief, J. Wreford Watson, who took over the important position of Director of the Geographical Branch in the Federal department of Mines and Technical Surveys, Ottawa.

At the University of Western Ontario an enrollment of 750 students in geography courses in 1947 showed the importance of geography in the university curriculum. Geography was given the status of a sub-department under geology. In 1949 it became a full department under Edward Pleva. Geography at Western has gained a leading place in regional planning developments and educational training in the area of southwestern Ontario where the staff's energies have been concentrated.

Paralleling the expansion in Eastern Canada, the University of British Columbia began reorganizing its geography courses in the Department of Geology and Geography. In 1945 the first two geography-trained instructors were added -- T. R. Weir (University of B. C. and Syracuse) and Mrs. G. O'Brien (London). In 1946, J. Lewis Robinson, formerly geographer for the Northwest Territories Administration, Ottawa, was appointed to help reorganize and expand geography courses. Geography was also added to the curriculum of Victoria College (affiliated with University of British Columbia) in Victoria, in 1947. Lectures were given by the late Donald Kirk, the first University of Toronto honours student to receive a Ph. D. (Northwestern).

Some of the smaller Canadian universities have begun adding geography to their curriculums during the last few years. In a few cases geographers have been given the responsibility of organizing and teaching the courses but frequently a single course would be given by a member of some other department. The University of Manitoba appointed T. R. Weir in 1949 in the Department of Political Economy. Ottawa University and Carleton College, in Ottawa, also have geographers on the staff in a part-time capacity. Other universities currently have committees meeting on the establishment of geography, and appointments may be expected as soon as suitable candidates are found.

Among the large universities it is notable that geography departments are not found at Queen's University, in Kingston, Ontario, or at the University of Alberta, in Edmonton. At the University of Saskatchewan, geography lectures are given in the Department of Geology, and at the University of New Brunswick geography will be introduced in 1951 by an economist. Many of the smaller universities and colleges cannot afford full-time specialists, and geography courses are given by lecturers not trained in geography.

Although the quality of this work will vary with the interest of the instructor, it is at least encouraging to see that an attempt is being made to present geography courses.

Geography enrollments have remained high at each of the leading universities, despite the gradual decline in total university enrollments after 1948. In 1949-50 there were over 800 geography enrollments at each of Toronto, Western Ontario and British Columbia. Graduate students were becoming more numerous, and were placing a heavy load on the teaching staffs, already overworked with large undergraduate classes, and having generally poor teaching equipment and facilities. Toronto and McGill were handling the largest graduate groups, with 25 and 21 respectively registered in 1950. The other universities giving graduate work were: University of British Columbia, Western Ontario, Montreal and McMaster.

Geography has advanced a long way in Canadian universities in the past decade. In most cases the requests for new courses and expansion have come from administrative officers who have realized the need for geography courses in a general education program. Geography has fulfilled these expectations, as indicated by student interest and general acceptance by other university departments. With falling university enrollments and smaller budgets it is doubtful if the larger departments can expand further despite the need to free senior staff for upper year and graduate courses. There still remains the problem of placing geographers in the small universities to consolidate the courses now being given by non-geographers. It is unlikely that the geographer's attitude and enthusiasm will be found in the non-geographer, although the factual course content may be given with little difference.

Geography is now established in Canada. The founding of the Canadian Association of Geographers, which held its first meeting in Montreal in May, 1951, along with other Learned Societies, is a sign of the maturity of the subjects and the number of adherents. It is time, however, that Canadian geographers stop and survey their progress and failures. We believe in the subject as being important in general education, and as a profession which can contribute to government, business and industry. Within the past five years there has been a shift in emphasis in geography training. Formerly geography was taught as part of a general Arts program, and taken by students who returned to teaching in the primary and secondary school systems. We are now giving graduate work to students who become professional geographers seeking employment chiefly in the government services. Thus, it is apparent that there must have been an awareness of the value of geography in the government which has paralleled the expansion of geography courses in the universities.

Geography in the Federal Government

Geography is a comparative newcomer into the field of government service in Canada. This introduction has paralleled, to a smaller degree, the increasing use of geographers by the federal and state governments in the United States. It has been made possible through the expanded training now being offered by several departments of geography in Canadian universities. There are from 10 to 15 geographers with graduate degrees being turned out each year -- a small number compared with any one large American university, but a large number for the small Canadian population and the newness of the field. To the present, the major outlet has been in government service, but not to be overlooked are the opportunities and contributions which geographers (whether called such or not) can make to business

and industry. This latter field has hardly been scratched in Canada, chiefly because all of the graduates have been absorbed in waiting government positions.

There were no professionally-trained geographers in the Federal Government service prior to 1943. There were, however, government agencies and personnel doing work of a geographical nature, as defined by the present concepts of geography. For example, in 1904 a Bureau in the Department of the Interior was undertaking studies of a geographical and economic nature concerned with the development and settlement of western Canada. In the 1920's, the Natural Resources Intelligence Service of the Department of the Interior did excellent work in compiling, analyzing and publishing information about the extent and distribution of Canada's resources. Their booklets were widely distributed throughout the United States, and unfortunately, are still the main source of information about Canada for many universities -- and even geography writers! Although the Intelligence Service was discontinued in 1930 owing to government economy, many of the personnel were distributed to other branches where their services were used on a smaller scale. When one considers that at that time there were in Canada no formal departments of geography, (excluding the academic-concerned courses in Montreal), this development of a service which was distribution and descriptive-minded is notable. Incidentally, the term geographer was in use in the Civil Service classifications, but it referred to a draughtsman who was concerned with map-making in some of the map-producing divisions.

In the early years of World War II there was still the common misconception among numerous government officials that geographers were purely draughtsmen, or at best, cartographers. This map-making function was the main purpose of the Geographic Section of the General Staff. The Chief Geographer for Canada was in charge of the branch which compiled and printed topographic and political maps of the Dominion and parts of it. Although geographers found a use for their particular talents in the Armed Forces of most nations, I am not aware of any geographer being used as such in the Canadian Forces. There were, however, a few geographers performing other duties with the Forces. Part of this deficiency is due, of course, to the lack of Canadian geographers, since the development of geography in the universities prior to the war had been too recent to turn out many trained personnel. In addition, university education in geography had been on a "cultural" level, primarily aimed at presenting a core of world knowledge to prospective teachers.

Despite the use of geographers by other nations, it was not until 1943 that a branch of the Federal government hired its first geographer. During the summer of 1943, Dr. Trevor Lloyd, naturalized Canadian teaching at Dartmouth College, carried out a research project for the Canadian Wartime Information Board. His work interested several government officials in the contributions of a geographer. In August 1943, the Northwest Territories Administration, of the Department of Mines and Resources, appointed J. Lewis Robinson, a Canadian trained in American departments of geography, "to compile, organize and analyse information about Northern Canada for wartime purposes and peacetime development." In 1945, an assistant geographer, Mrs. M. Josephine Robinson, was added to the staff, and assisted in the publication of numerous articles describing various phases of the geography of Northern Canada. This work ceased in 1946 with the departure of the Robinsons to the Department of Geology and Geography, University of British Columbia.

At the end of the war government officers were becoming aware of the work which geographers could do. It was also apparent that Canada was

one of the few important countries not having a geographic section in its government departments. This lack was noted by Dr. H. L. Keenleyside, then Deputy-Minister of Mines and Resources, who had been interested in geography for many years. He was instrumental in establishing a Geographical Bureau in the Department of Mines and Resources (formerly Interior) in June, 1947. The Bureau was organized and headed by Dr. Trevor Lloyd, on leave of absence from Dartmouth College.

The purposes of the Bureau were to "collect, organize, and make readily available, geographical data on Canada and foreign areas of importance to Canada." Much of the work must of necessity concentrate on the less-known parts of Arctic and Subarctic Canada. This information is gathered by field parties of permanent and summer-employed personnel, staff attached to other expeditions of a specific nature, and research workers in the head office in Ottawa. The Bureau was meant not only to be an information centre on all matters of Canadian geography for government, military or civilian organizations, but to be a research centre for Canadian, and other geographers interested in specific, non-classified areas or topics. Towards this end a central map library was established containing all Canadian and most foreign maps. There is also an excellent library of reference and source books, periodicals, reports and photographs. One of the specific assignments given to the Bureau was to direct the organization of staff and information for a new Atlas of Canada.

In 1949, Dr. J. Wreford Watson, formerly head of the department of geography at McMaster University, became Chief of the Bureau. Next year the Bureau was elevated to the status of a Branch in the newly-organized Department of Mines and Technical Surveys. In 1950 the Branch had a staff of about 10 geographers, plus administrative, cartographic and secretarial help. During the summers of 1950 and 1951 it had 8 to 10 parties in the field and additional temporary summer staff both in the field and doing office research numbered between 20 and 30.

Another organization in the Federal government using geographers is the Joint Intelligence Bureau which was established in 1947 in the Defence Research Board, Department of National Defence. In 1948 the Bureau was headed by Ivor Bowen, geographer from Manchester, England. J.I.B. has a staff of five permanent geographers (as well as economists and engineers), and in addition hires university geography students as summer staff to do specific research projects as requested for military or strategic reasons.

The organization of geographic functions in the Federal government has not paralleled the pattern in the United States. In the U.S.A. geographers are hired by many departments and branches for specific work, resulting in a certain amount of duplication of effort. In Canada, the geographers have been centralized into one main office where requests from government offices may be channeled, and staff employed with greater efficiency. Since the Canadian government is not as elaborate a bureaucracy as that of the United States, it is still possible for most of the scientists and administrators to know one another, and to cooperate.

Provincial Governments

The use of geographers by several of the provincial governments is recent. Since there have been so few Canadian geographers, and until 1950 the demand exceeded the supply for academic and federal appointments, there have been fewer applications to provincial authorities. They have, therefore, probably had less reason to know about the type of work which

geographers can do. As is so often the problem with this "new subject," geography, in Canada, it is not that there is a lack of geographic work to do in provinces, it is a matter of persuading conservative, "old school" administrators that geographers can do the work. In outlining the work being done by geographers in the various provincial governments I believe that you will be more interested in the type of research that is being done than with details of positions and personnel. Since most of us are interested in geographic work, either for ourselves or our students, you may then compare it with the work done by geographers in your own states.

There are no geographers working for any of the four Maritime provinces of Eastern Canada. This neglect is not surprising when we recall that there are also no geographers in the small universities, and very few geography courses being taught. Part of the difficulty is economic. The Maritime provinces are poor and their population scanty; their government services are therefore small and have relatively few specialists. A small amount of geographic research has been carried on by university staff members from northeastern United States or eastern Canada.

As in the academic field, Quebec has been one of the first in the use of geographers in the provinces. As early as 1937 a government Act called the "Inventory of Natural Resources Act" was passed, and an Economic Research Bureau was set up under the Department of Commerce and Industry. It was the duty of this Bureau to gather detailed information on each Quebec county. Geographers, notably Benoit Brouillette and his students from the University of Montreal, have been employed each year, along with other specialists. These teams put together organized information which is meant to be basic for government policy formation rather than public information. The Quebec government has no geographers, as such, in its Departments, but has employed geographers in many ways, as for example, sponsoring geographic research by university personnel in the Ungava region of northern Quebec. In the summer of 1950, two geographers were employed by the Quebec Department of Fisheries doing oceanographic work in the Gulf of St. Lawrence, and one was a cartographer with the Department of Commerce and Industry.

In Ontario, Dr. Donald Putnam of the University of Toronto has carried on research and publication on soils, climate and physiography for the Ontario Research Foundation, a semi-government-industrial agency. Other geographers have also worked for this Foundation, particularly on climate research. Geographers have assisted in the river valley flood control reports prepared by the Ontario Department of Planning and Development. Southern Ontario has been divided into regions which correspond to the major watersheds, and detailed regional studies are now being carried out. Several large reports have already been published. Although the purpose is primarily flood control and recreation development, the reports are geographical inventories which may serve many purposes. After the end of the war a Land Utilization Survey was established in the Department of Planning and Development, headed by a geography graduate from the University of Toronto. Student geographers are hired by this Survey each summer to assist with field work. Other geographers working in the Ontario government are in the Fish and Wildlife Division, and Land Classification Research Division of the Department of Lands and Forests.

In southwestern Ontario, Dr. Edward Pleva of the University of Western Ontario has been directing research on a local and regional basis in the fields of land utilization, conservation, flood control, and the decentralization of industry. This work has been sponsored by both provincial and local agencies.

In addition to work for government departments, geographers are also employed in Ontario by the Town Planning Commissions of Toronto, Hamilton and London. In these commissions the geographer's techniques, particularly in cartography and in showing distribution and flow patterns, are combined with the work of other specialists.

Saskatchewan was the first of the Prairie Provinces to use geographers. Perhaps this is not surprising when one considers that their Socialist-type government is greatly interested in resource planning. During the summer of 1947 a geographer carried out studies on suitable trapping regions in northern Saskatchewan for the Department of Natural Resources. During the summer of 1949, two geographers worked on projects in the field of regional planning, resource management and parks surveys. In 1950 the Department of Natural Resources hired a full-time geographer, and had three geography graduate students doing summer work. Two of the men remained with the Department in the fall with positions as Executive assistants, and a U. B. C. graduate returned there in 1951 to become geographer in the Parks Division doing recreational land use. Canadian geographers hope that the expanding use of geographers in Saskatchewan may be paralleled in other provinces when they realize the contribution of our profession in resource and regional planning.

The Province of Alberta appointed its first geographer in the fall of 1950. H. N. Lash, formerly at McGill University, joined the Department of Public Works as assistant director of Town and Rural Planning. Early in 1951 his work was shifted to the Department of Municipal Affairs and he was made Director of the Division. A second geographer was added to the staff in the fall of 1951. The work is concerned with area analysis of local resources and population as they will affect the future growth of Alberta towns. These regional studies then become the basis of town and city planning. The city of Calgary, Alberta, has followed this example by appointing a geographer to its technical staff on the Town and District Planning Commission.

In British Columbia a geographer was first used during the summer of 1947 in the newly-formed Land Utilization Survey, in the Department of Lands and Forests. And in 1948 Professor John Chapman of U. B. C. was in charge of the Land Utilization Survey in the Peace River area, two geographers were with the Survey in the Prince George area, and one was in south-eastern British Columbia. In 1949 there were five geographers with the Land Utilization Summer Survey and one with the Provincial Parks Division. A similar arrangement prevailed for the 1950 summer field season. In 1949 the Department of Lands and Forests employed a geographer for a special survey of the effects of flooding in the East Kootenay area if the proposed Libby dam is constructed on the Kootenay River in Montana. The first geographer (although not so-called) to join the British Columbia Government on a full-time basis was Donald South, who was appointed Assistant Director in the Regional Planning Division, Department of Municipal Affairs, in 1949. In 1950 another U. B. C. graduate geographer was placed in the provincial Parks Division doing recreational inventory and mapping, and another graduate obtained full-time employment with the provincial Land Use Survey. In 1950 an unique organization in Canada, called the Lower Fraser Valley Regional Planning Board, was established. It is supported by federal, provincial and municipal governments. Its purpose is to take inventory of the Fraser River delta area and plan for organized future development. One of our geography graduates, Al Crerar, whose paper on Prince Rupert appeared in the 1949 Yearbook, was named geographer for the Planning Board.

Conclusion

The preceding survey indicates that geographers are not being utilized in the same way in the provincial governments as in the federal field. Although there has been an increasing use of geographers for summer work in some of the provinces, there are only a few full-time geographers employed. There are no geographic branches or divisions established in any of the provincial governments, but simply geographers attached to some already-existing department. One of the difficulties lies in the provincial administrative organization, where the work and scope of a geographer overlaps several departments and, therefore, cannot be definitely pigeon-holed into any one of them. In the larger scale federal government this overlapping into specialists' fields has permitted the centralized Geographical Branch to do work for other departments rather than having the separate departments each hire a geographer who might not be needed full-time. In the smaller provincial organizations the geographer therefore has less scope and his work is limited to more or less specialized topics.

It appears that one of the future needs for geographers in the provinces will be in the related fields of resource management, conservation and land utilization. These matters of resource and land management are under provincial jurisdiction rather than federal. It is notable that there is a correlation between the use of geographers in the provinces of Quebec, Ontario and British Columbia, and the fact that geography has been longer established in the universities of those provinces. This may indicate that the universities have brought an awareness of geography as a professional field into the governments, and that the latter are using geographers as trained personnel become available. In Canada we hope that this cooperation will continue, with the departments of geography pointing their professional training towards the needs of their provinces.

SOVIET TERRITORIAL ANNEXATIONS IN EASTERN EUROPE

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One of the most significant features of postwar Europe has been the westward expansion of Soviet power as a result of the second World War. This expansion has taken place in a number of ways: idealogically, through the impact of Communism; politically, through the extension of Soviet hegemony and influence; economically, through the shift of the trade of Eastern Europe from Germany to Russia; areally and demographically, through annexation and settlement of territories taken from countries in Eastern Europe.

This westward advance is marked by three different zones. In the far west, Eastern Germany and Eastern Austria are under Soviet military occupation. A central zone of satellite states has been created under Communist governments. In the eastern edges of the zone of expansion, the U.S.S.R. has annexed territories all along her western border from the Arctic Ocean to the Black Sea.

Since 1939, the Soviet Union has annexed some 187,000 square miles with a population of almost 23 million. This was by far the greatest territorial change of the war, as indicated by the estimate that a total of 34 million was involved in all territorial transfers of World War II.

Soviet annexations were accomplished in two phases. In 1939 and 1940, Russia seized areas from Finland, Poland, and Rumania and incorporated the three Baltic countries of Estonia, Latvia, and Lithuania. Temporarily, these areas were occupied by Germany, or were retaken by the original countries, as in the case of Finland and Rumania. In the postwar period, Russia reannexed the areas and added others. Political control was consolidated through peace treaties, long term leases, by locally held elections, which ruled in favor of union with the U.S.S.R., or by agreements made with the major allied powers, such as at Yalta and Potsdam. It is to be noted that the United States does not recognize the Soviet annexation of Estonia, Latvia, and Lithuania, and that final disposition of East Prussia, partitioned between Russia and Poland is legally dependent upon conclusion of a German Peace Treaty. All the areas, however, are now treated as integrated parts of the Soviet Union.

Finland

Finland was the first country to suffer territorial losses as a result of the Soviet invasion launched on November 30, 1939. Through the Soviet-Finnish Peace Treaty of March 12, 1940, 16,173 square miles were ceded to Russia, but were regained in 1941, when Finland joined with Germany in defeating a second Russian invasion. Under the Peace Treaty of February 10, 1947, the Soviet acquisitions of 1940 were confirmed and through leases and additional cessions, the U.S.S.R. gained 19,300 square miles of Finland.

Of great loss to Finland was the 5,000 square mile area of Petsamo on the Arctic Ocean, to which Finland no longer has access. Petsamo has valuable mineral deposits, especially nickel, and the ice-free port is of great economic importance to Russia, in that the port of Murmansk, so well known in World War II, must be kept open by ice-breakers. A primary difficulty, however, is the lack of railroad connections from Soviet territory to Petsamo.

Of even greater significance was the loss of the Karelian areas near Lake Ladoga, which included some of the best agricultural lands of Finland,

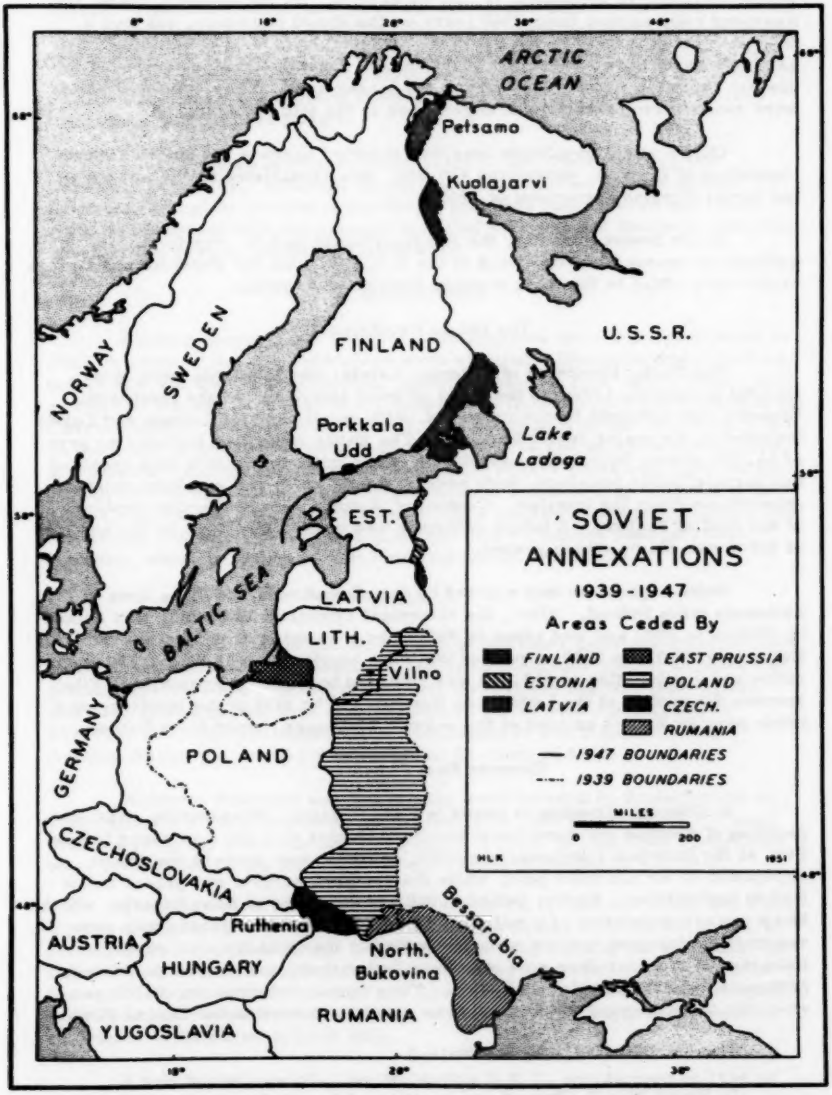

Fig. 1. Soviet Annexations, 1939-1947. It is to be noted that the United States does not recognize the annexation of Estonia, Latvia and Lithuania, although they are now treated as republics of the U. S. S. R. and certain territories have been ceded to other Soviet republics as indicated on the map.

where agricultural production is limited at best. On the southern coast, the Russians relinquished their 1940 lease on the Hangö peninsula, but took a fifty year lease instead to the Porkkala-Udd peninsula west of Helsinki, thus gaining a naval base for control of the Gulf of Finland and also control of the coastal railroad, which runs through the leased area. Thus command points were secured for protection of approaches to the city of Leningrad.

Only a slight population loss was involved because the entire Finnish population of Karelia, numbering 420,000, was repatriated to Finland under the Soviet-Finnish agreement of 1940.

A new Soviet Republic, the Karelo-Finnish S. S. R. was formed of portions of annexed territory and of the U. S. S. R., but the Petsamo and Ladoga areas were added to the main Russian Federated Republic.

The Baltic Republics

The Baltic Republics of Estonia, Latvia, and Lithuania were incorporated in August, 1940, on the basis of local elections, as the fourteenth, fifteenth and sixteenth Soviet republics, with small parts of Estonia and Latvia included in the major Soviet Republic. The Baltic Republics included an area of 66,700 square miles and a population of six million. Russia thus regained her former Baltic boundary, with several Baltic ports and excellent railroad connections from the interior. Control of Estonia assured further protection of the Gulf of Finland. A future difficulty was posed, however, by the addition of three non-Slavic ethnic groups.

Another problem was created by the allocation of the Vilna area to Lithuania from Poland. Vilna, the historical capital of Lithuania, was seized by Poland in 1920 and was given to Poland by a decision of the League of Nations in 1923. In 1939, a part of the Vilna territory, including 2,750 square miles and a population of 475,000 was returned to Vilna by Russia, and Vilna became the capital of the Lithuanian Republic. The rest of the territory was taken over by Russia as part of the eastern provinces seized from Poland.

German East Prussia

A different situation is posed in East Prussia. Presumably, final disposition of German territory must await conclusion of a German peace treaty. But, at the Potsdam Conference in 1945, approval was given to the Soviet occupation of the northern part, while the southern portion was placed under Polish jurisdiction. Russia gained 7,000 square miles of East Prussia, which had a prewar population of a million. The key port of Konigsberg was soon renamed Kaliningrad and the area was added to the main Russian republic. Kaliningrad is an ice-free port with excellent railway connections to Poland, Lithuania, and the interior of Russia. Thus Russia extended her Baltic possessions to encompass the southeastern coast northward to the Gulf of Finland.

Poland

In World War II, Poland was partitioned for the fourth time in two centuries. Invaded in September, 1939, by both Germany and Russia, Poland was divided, with more than half of its territory, some 78,000 square miles alloted to Russia. Although this partition was abrogated by Russia in 1941, the eastern provinces of Poland, peopled mainly by Ukrainians and White Russians, was awarded to the U. S. S. R. by the Soviet-Polish treaty of August, 1945.

A new boundary was defined, following broadly the famed "Curzon" line of World War I with certain deviations in favor of Poland in the southern

sector. The Soviet Union was given 69,860 square miles of territory with an estimated population of 12,000,000. As partial compensation, Poland annexed the eastern provinces of Germany, thus moving westward in relation to its prewar position. A repatriation treaty provided for the transfer of a million Poles from the eastern provinces and a return transfer of 500,000 Ukrainians in Poland to Russia.

These eastern provinces were added to the White Russian and Ukrainian republics. Although the plains areas afforded no new natural frontiers, complete control of the Pripet Marshes was assured and contiguity was provided with the annexed areas of Ruthenia and Northern Bukovina, which are of greater strategic significance.

Czechoslovakia

Russian demands for Czechoslovak Ruthenia were expressed early in 1943 on grounds that the Ruthenians were ethnically Ukrainian and should be united with the Ukrainian Republic. Ruthenia had, in fact, never been a part of Russia, but had been part of the Kingdom of Hungary until the formation of Czechoslovakia in 1918. But, in 1945, it became part of the Ukrainian S.S.R. on the basis of an election held in Ruthenia in 1944 and on agreements made at Potsdam. Ruthenia, with an area of 5,000 square miles and a population of 800,000, is of great strategic importance to the U.S.S.R. because it includes a portion of the Hungarian Basin and a railroad through the Carpathian Mountains. In addition, the U.S.S.R. now has a common boundary with Hungary, which is of great value from a political standpoint.

Rumania

The significance of the annexation of Northern Bukovina must be evaluated in relationship to Ruthenia, in that it consolidates control of more Carpathian territory and of a major rail line through the capital, Chernovtsy. Northern Bukovina, an area of 2,035 square miles with a population of 500,000, was, like Ruthenia, a new acquisition in that it had belonged to Austria-Hungary prior to its inclusion in Rumania in 1919.

Northern Bukovina and Bessarabia were invaded by Soviet troops in 1940, and were ceded to Russia by the treaty of June 28, 1940. They were reoccupied by the Germans and Rumanians in 1941, but the 1940 boundaries were reaffirmed by the Rumanian Peace Treaty of February 10, 1947.

The addition of Bessarabia, an area of 17,325 square miles and a population of 3,200,000 was of much greater agricultural value to the U.S.S.R. Strategically, it placed Russia on the Danube, thus making her a Balkan and Danubian power. Russia's riparian situation was used in 1948 as the basis for exclusion of the United States and Great Britain from further participation in international control of the Danube, which the Soviet Union felt should be restricted to Danubian nations only.

A new Soviet republic, the Moldavian S.S.R. was formed in 1940 of central Bessarabia and the previous autonomous region of Moldavia in the Soviet Union. The northern and southern areas and Northern Bukovina were added to the Ukrainian S.S.R.

TABLE I

Soviet Annexations in Eastern Europe

1939-1947

Country	Area (square miles)	Population (Pre-war Estimates)
Finland	19,300	---
Estonia	18,353	1,134,000
Latvia	25,395	1,194,506
Lithuania	22,959	2,879,070
Germany (East Prussia)	7,000	1,000,000
Poland	69,860	12,000,000
Czechoslovakia	5,000	800,000
Rumania	19,360	3,700,000
	187,227	22,707,576

Conclusions

Through these annexations from 1939 to 1947, not only were the Russian territories lost in 1919 regained, but new territories, Ruthenia and Northern Bukovina, were annexed as well. Strategically, the U.S.S.R. advanced in four specific directions. The Arctic flank was extended and the ice-free port of Petsamo gained. In the Baltic area, significant protection of the approaches to Leningrad were achieved, and the "window to the west," as expressed by Peter the Great, was considerably widened with additional ports and transport facilities. Through Ruthenia there was penetration into the Hungarian Basin, a vital core of Central Europe, and through Bessarabia, Russia became a Danubian and Balkan power. From the standpoint of Soviet administrative structure, five new republics, Finno-Karelia, Estonia, Latvia, Lithuania, and Moldavia, were established with consequent increase of population, agricultural and industrial resources, and transport facilities. From the political standpoint, a psychological advantage was gained by the extension of Soviet borders to Norway and Hungary.

Thus the territorial annexations in Eastern Europe have given signal political, strategic, and economic advantages to the Soviet Union. It remains to be seen if they are final objectives, or if they are but stepping stones to future expansion westward into Europe.

TRANSPORT IN THE ALGERIAN SAHARA*

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The conquest of Algeria by France during the 1830's was halted at the margins of the Sahara by the local resistance of tribal populations, in combination with the difficulties of travel across the great expanses of barren desert. Transportation was one of the problems the French had to solve before they could complete their territorial control of all the desert country.

The old trans-Saharan camel routes were used only by the native inhabitants. The caravans were slow, and they were subject to attack by interior nomadic tribes. Their main function had been to carry goods between the Sudan and North Africa. When the disease-infested forests of the Guinea Coast were penetrated by the French and the English and the country was pacified, the Sudan could be reached from the coasts. Therefore the trans-Saharan camel caravans disappeared. As a means of native transport for shorter distances, the camel has, of course, persisted to the present.

By 1870, France held territory in both North and West Africa, and the railway age had arrived. A Trans-Saharan Railway to link the possessions of Algeria and the Sudan was considered. In strategic value and length, the Trans-Saharan would be in the same class as the transcontinental lines in the United States, Canada, Australia, and Siberia, which were being discussed or constructed during this period. But such a Saharan railway would cross the greatest of all deserts with the prospect of the smallest economic returns from freight and passengers.

There were two possible routes for a railway. An eastern route would pass through a number of large oases which could supply water for the railway and probably contribute some freight and passengers. However, this route would lead through the Hoggar mountains, requiring difficult and costly construction. Also, the fierce Tuareg mountain tribes had traditionally preyed upon travellers through the Hoggar, and had not yet been conquered. A western route would cross no mountains south of the Atlas, but would have to penetrate the Tanezrouft, the flat, terrible land of thirst, which stretches for hundreds of miles without wells, oases, vegetation, or animal life of any kind.

The French, therefore, decided at first to avoid the Tanezrouft, and started exploring the eastern route. The project was abandoned when Colonel Flatters and his party were ambushed and killed in the Hoggar Mountains in 1881. Since that time, plans for a Trans-Saharan railway, along both eastern and western routes, have been revived and dropped many times. For the last two decades, the western route has been favored. Although both the northern coast of Algeria and parts of the Sudan are now served by railways, the great cost, the physical difficulties, and the small economic returns have thus far made a railway across the desert impracticable. By the end of World War I the Algerian Sahara was completely pacified and there was the possibility that improved types of automobiles or airplanes might provide transport across the desert.

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* This article is largely based upon field work in the Sahara during January and February, 1951, under research grants from the Office of Naval Research and the University of California, and constitutes a first summary of a larger project concerned with transportation in North Africa.

The early attempts to penetrate the Sahara by airplane resulted in a series of tragedies. Planes could fly only short distances without refueling. Both speed and dependability were low, according to present standards. When a plane was caught in a violent sandstorm, it often crashed or lost its way and was forced to the ground as fuel became exhausted. Whether the crew remained with the plane, or set out on foot to find water, the chances for survival and rescue were slight. The remains of plane and crew might not be found until a year or two later.

The automobile, however, had marked success from the first. The French Army had already used trucks in the northern Sahara in putting down native uprisings during the first World War. A road net soon served the northern oases. Then, in 1922, the first crossing of the desert was made by civilians in caterpillar-wheeled, or half-track vehicles. The Sahara had finally been crossed by modern means of land transport!

For a period there was intense rivalry between the half-track vehicle and the six-wheeled truck. The half-track was better for crossing sand dunes, but most of the Sahara has a rocky or gravel surface rather than sand. Also, the main motor routes do not go through the ergs, or dune areas. Caterpillar trucks were slow, expensive, and unwieldy. They consumed great quantities of fuel in going short distances. The six-wheeled truck triumphed.

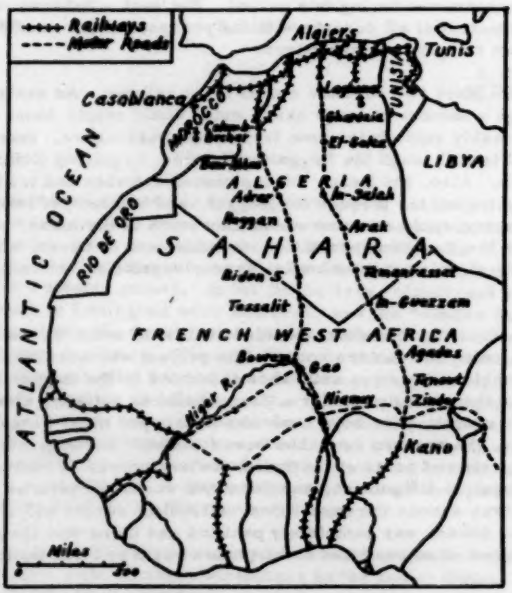

Fig. 1. Trans-Saharan Motor Roads.

On the Saharan routes, each settlement shown is a stopping place for the bus at the end of a day's journey.

Later, however, when balloon tires were developed, the regular four-wheeled truck became as effective in gravel or on rough roads as the old six-wheeled trucks with high pressure tires. Four-wheeled trucks are also less expensive, and are easier to repair. For heavy loads, of course, dual tires can be used on the rear wheels. Therefore, for some years Saharan trucks and busses have differed little in general appearance from those found elsewhere.

By 1927, bus lines -- using six-wheeled vehicles at first -- penetrated both the Tanezrouft and the Hoggar, generally following routes suggested earlier for railways. (See Figure 1.) Airplanes were much improved by that time and, within a very few years, air lines started operating. Planes at first followed the trails used by the busses, both as a means of navigation and as assurance that they would be rescued if they should make emergency landings. Each of the two routes had a bus company which owned, or was affiliated with, the air line using the same route.

The airplane gradually advanced from an adjunct of the autobus to a means of transport in its own right, with its own routes. Furthermore, the busses can operate only during the cooler eight months of the year; none cross the desert during the terrific heat of the summer. The planes, of course, can fly throughout the year, except during severe storms, and several lines now offer dependable trans-Saharan service at intervals of five days to two weeks.

The sand dune areas are still served by camels, and donkeys are used for trips between nearby oases and within settled areas.

The two transport routes have different kinds of traffic because of the geography of the regions which they cross. On the western, or Tanezrouft route, the bus line makes a fast crossing over a short and level, but exceedingly barren route.[1] The automotive equipment used really serves both freight and passenger purposes. The combination truck and bus must carry a heavy load of water, food and fuel, for at many places enroute none is obtainable. Since this is the shortest and fastest trail, the route is favored for freight. Sugar, tea, flour, and manufactured goods are hauled southward to Saharan oases and to the Sudan. Materials like wool, hides, leather, goats and peanuts are carried northward. Passengers ride in a compartment right behind the driver and mechanic, but ahead of the freight space occupying the rear of the vehicle. The bus is often run in a convoy with one or two trucks which carry only freight. The vehicles in a convoy can, of course, assist each other in emergencies. The crossing takes six days.

The northern part of the route follows the Wadi Saura for several hundred miles, avoiding the great dunes. There are small oases at which the bus stops at night, like Beni-Abbes, Adrar, and Reggan. (Figure 1.)

Most of the last 800 miles of the trip, however, is across the Tanezrouft. For a distance there is a road, but nothing else. Even the road ends where the surface becomes soft. The crust of hard-packed gravel is broken by the first vehicle, so others drive to one side or the other to avoid getting

1. This western route or trail extends from Colomb-Bechar to Gao -- the first place where one can change to another bus line or to an air line. The eastern route extends from Algiers to Zinder, where transfer can be made -- a much longer route.

stuck in the ruts, until the trail has a width of several miles. Markers, made of metal stakes, oil drums or piles of stones, help one to follow the trail.

Wind and shifting sand may obscure the track. Some crossings, especially after sand storms, are more difficult than others, and all vehicles must carry emergency equipment. Heavy vehicles may break through the crust and get stuck several times during a crossing. Loose sand may make it necessary to drive for miles in second or low gear. Passengers sometimes have a poor choice of opening the windows to get fresh air along with choking quantities of red dust, or of closing the windows to make a hothouse in which one roasts under a coating of perspiration and dust. The Tanezrouft has a depressing effect upon both native and European!

In order to cover the great distances between oases, passengers and crew usually arise each day at about 2 a.m., start at 3 a.m., and sometimes ride until after dark. Lunches are eaten in the open desert in the shade of the bus. Halts at night are made at stations of sheet iron or mud. The passengers are usually government employees, business men, military personnel, or scientists, rather than tourists. The busses make desert crossings once every two weeks in each direction during the cooler months, and usually have about six passengers. The trail and the accommodations are being improved continually, to attract more passengers. Private automobiles, after careful preparations, may now cross the desert safely on this western route.

The busses on the eastern or Hoggar trail usually depart at 6:00 or 7:00 in the morning, instead of at 3 a.m. The route is higher and slightly cooler than the Tanezrouft. The more leisurely crossing takes about twelve days, including halts of one-half day or a day at certain oases. Through busses make one trip every two weeks during the cooler months, the same as on the other route. Steep grades, rough surfaces, and winding routes are characteristic of the mountainous areas. Private automobiles now may use this route also.

Tourists from France, Switzerland, England and Germany are attracted to the fascinating seven cities of the Mzab, of which Ghardaia is the largest in size. Each city is built on a hill or mesa with a dominating square-towered mosque. The Mozabites, as the inhabitants are called, differ in religious belief from the orthodox Moslems, which long ago resulted in persecution and eventual flight to this inhospitable portion of the Sahara. In a sense, the history of the Mozabites parallels that of the Mormons in the United States, even to the conversion of a desert area into a productive region by means of irrigation, and in the present development of the tourist trade.[2]

Farther south, the oasis of El Golea is famous as a veritable Eden in the midst of the barren desert. The fragrance of the flower gardens, the absolute calm and mystery of the desert night, and the beauty of the irrigated fields tempt some tourists to return many times.

Other tourist features along this eastern route include the rugged mountains and desert basins of the Hoggar, with the once-feared Tuaregs as added attractions, reminding the writer somewhat of the mountain, desert, and Indian country of Arizona and New Mexico. Tamanrasset, little more than a village, is the center for tourists in the Hoggar, with both air line and bus

2. The Mzab is a much more desolate region than Utah, however. Ghardaia has only 16,000 inhabitants, about a tenth the size of Salt Lake City, with hotel and travel facilities in even smaller proportion.

connections with North Africa. It is also the southernmost French military post in Algeria with mostly native (Tuareg) soldiers. Many tourists venture no farther south for the trail beyond is within the Tropics and is very slow and rough. The French have capitalized on the advantages for the tourist trade by adding hotels and restaurants which are far better than any along the Tanezrouft route.

In summary, this description of transport in the Sahara illustrates two conditions. First is a point which, although often mentioned, still bears repeating: Deserts have their own personalities and are often characterized by variety and contrast rather than by homogeneity and monotony.[3]

Second, the kind of transportation and the nature of the traffic may be closely related to the landforms, resources, settlements and other features of desert regions traversed, just as in humid lands. In the Algerian Sahara, the use of cheap and durable donkeys for oasis and local travel and of camels for the erg regions is quite logical. The soft sand of the dunes is more suitable for the feet of the camel than for wheeled vehicles. On the other hand, the rocky plateaus often have hard surfaces and sharp rocks; they are avoided by camel drivers whenever possible. In the erg regions, far from European settlements and garages, where gasoline sells at fantastic prices if it is obtainable at all, and grass can be found by the fleet and the skillful, the camel will probably take precedence over the expensive automobile for some time to come. The French encourage camel breeding and have troops mounted on camels in appropriate areas.

On the hamadas, or rocky plateaus, the two trans-Saharan motor trails likewise reflect the conditions of their respective areas. The bus and truck line through the Tanezrouft has a good trail, for the Sahara, over a short, level and exceedingly barren route. It is therefore well adapted to through-freight, and offers the fastest, cheapest crossing for passengers who are not seeking comfort or tourist attractions.

The longer, slower and rougher route through the Hoggar has little freight, but it offers a variety of landforms and intriguing settlements. It has shorter daily trips, partly because oases are closer together, and it is less uncomfortable in some respects. Accordingly, through passengers are almost entirely tourists. Daily trips are made to the northern oases during the height of the winter tourist season, and natives from the large oases provide additional traffic for the northern portion of the route.

3. Two recent works demonstrating variety as a feature of deserts, one on a large, general scale, and the other in more minute, detailed fashion are: M. H. Lelong, Le Sahara aux Cent Visages, Alsatia, Paris, 1948, and Robert M. Glendinning, "Desert Contrasts, Illustrated by the Coachella," Geographical Review, Vol. 39, No. 2 (April, 1949) pp. 221-228.

LOS ANGELES SMOG

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The annoyance caused by smoke, soot and other foreign matter in the air over cities is not simply a recent situation. Some seven hundred years ago, in 1307, Edward I of England was so annoyed he instructed his commissioners to "assess great fines and ransoms" against the Londoners who ignored his pioneering anti-smoke ordinance.[1] But only in the past 150 years, since the start of intensive industrialization, with its voluminous use of mineral fuels has the annoyance become really serious. The "Black Countries" of England derived their name from its effects, and the Donora incident of November 1948 pointed up the disasters which it may cause in areas of heavy industrial concentration.[2]

Several American cities have suffered this problem and some of them have at least partially cured their problems. Los Angeles, with its claim to sunny weather, currently is embarrassed by a volume and a frequency of foreign matter in the atmosphere that is proving difficult to eradicate totally. Our local climate may become permanently changed if eradication proves impractical.

In most industrial areas the problem of cleaning up the air is relatively simple. It is a case of installing devices that will completely burn the fuel and facilities that will remove the large particles, so that a prevailing wind drift will disperse the reduced amounts of air pollutants until the concentration is negligible. St. Louis and Pittsburgh solved their problems relatively easily.

But the situation in Los Angeles is unlike that in most other industrialized areas. This difference is owing in variable parts to the topography, to the climate, to the meteorology, to the type of industrial installations and fuels and to the sprawling expanse of and type of settlement pattern of the area. The purpose of this paper is to survey these causes of the smog in Los Angeles, to investigate some of the effects of the smog, and to tell what is being done to solve our smog problem.

Definition of Smog

The words smoke and fog, from which the term smog was coined, do not adequately define the problem in Los Angeles. Although smog is the term most frequently used, the Los Angeles County Air Pollution Control District is correctly named. Air pollution is more correct because analysis has shown the air here to contain not only water vapor and smoke, but also a complex and variable mixture of gases, solid particles, and droplets of other liquids.

Nevertheless, the term smog is well implanted in the local vocabulary and has definite connotation. A day is arbitrarily defined as smoggy by the Air Pollution Control District when at least four complaints are received. The complaints are classified under four headings: (1) crop or plant damage, (2) eye smarting, (3) obscuring of sun and visibility, and (4) local nuisance such as dirty wash or heavy dust fall. Of these, local nuisances and obscuring of sun and visibility are most common, eye smarting is most annoying, and crop or plant damage is of most economic importance.

Causes of Smog

Too often the causes of smog are oversimplified. Actually the problem is complex because of the natural conditions promoting smog formation

and also because of the sources of the air pollution. The natural conditions which are important to smog formation in the Los Angeles area are the local basin topography, the climate, and the meteorology. These are, of course, interrelated.

The Los Angeles Basin is a lowland surrounded on the north and east by hills and mountains and on the south and west by the Pacific Ocean. The hills and mountains are not continuous but the few low passes are not of sufficient size to permit large scale transfer of air through them. However, the hills are sufficiently high to block passage of air when climatic or meteorological inversions persist over the area. (Figure 1.)

Although smog conditions may develop in any season, the smog season, when more days of smog normally occur, is the period from June through November. At this time the northward migration of the Hawaiian High dominates the climate of the Southern California coast. The air within the Los Angeles Basin is overridden by the prevailing northwest winds blowing out of the high and a temperature inversion is set up which holds air pollutants to the surface. Normally the inversion must be in existence several days while a sufficient volume of pollutants to cause a smog are infused into the air. Obviously, the lower the base of the inversion the smaller the number of buildup days necessary and the more intense and more frequent will be the smogs. Fortunately, the shifting height of the inversion and steep pressure gradients to the desert on the east permit cleaning out of the smog on many occasions. Thus a smog attack rarely lasts more than a few days, although one attack in 1949 lasted 15 days from November 20 to December 4.

Meteorological conditions cause the occasional smoggy days during winter, diffuse pollutants through the lower atmosphere, and also affect distribution and intensity of smog within the Basin. On calm nights in winter a radiation inversion is developed by rapid cooling of the earth's surface. However, generally smoggy conditions throughout the Basin will not occur from this type of inversion. The smog will usually be localized at or near the source because there is little wind to distribute it widely. It is this type of inversion which both necessitates smudging of citrus and makes inevitable the localization of the smog associated with smudging.

The wind system within the Basin is very important in affecting the the distribution and intensity of smog. For the most part this is a normal land-sea breeze in a relatively closed system, out to sea at night and in toward land during the day. Working under the base of the inversion, this system would seem to distribute the pollutants evenly. But two factors make for an unequal distribution. These are the wind direction and velocity, and the configuration of the coast. The coast of this part of Southern California is mostly east and west but the coast of Santa Monica Bay is almost due north and south. (Figure 2.) This north-south section receives most of the sea breeze, apparently reinforced by the normal prevailing westerlies, whereas the east-west coastal sections west of Santa Monica and east of the Palos Verdes receive few onshore winds. Thus pollutants are generally moved from west to east during the day. The reverse flow at night is approximately the same. However, the speed of air movement is not equal in both directions. Normally the sea breeze averages between five and seven miles per hour, whereas the land breeze averages one to three miles per hour. Thus smog concentrates against the hills to the east of the Basin. It will flow out gradually through the low passes to the San Fernando Valley to the north and through the Pomona Valley and San Gorgonio or Cajon Passes to the Mojave Desert to the east. Or if the base of the inversion lifts or strong winds develop, it may be moved over the hills and mountains surrounding the Basin.

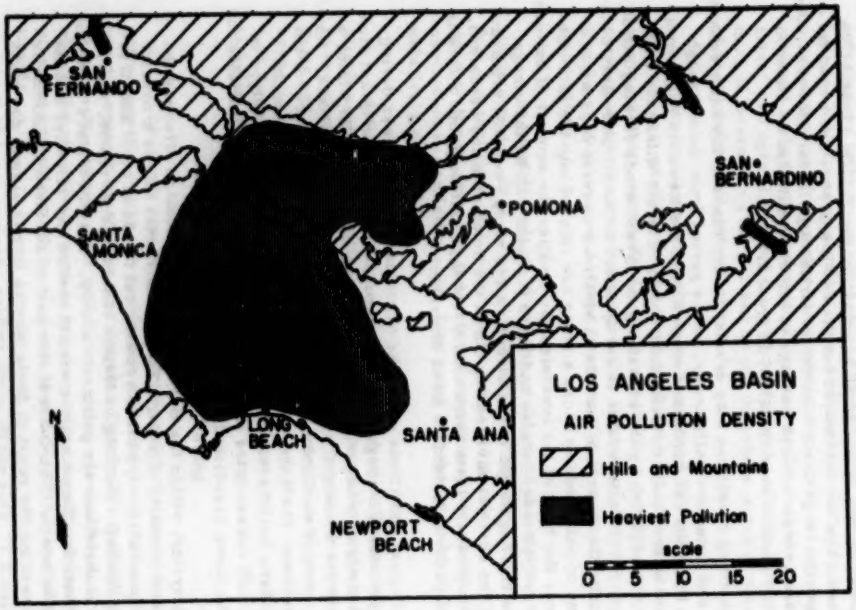

Figure 1. The north-south coast of Santa Monica Bay receives most of the on-shore day breeze sending smog eastward against the hills. S. M. is Santa Monica, L. A. is Los Angeles, L. B. is Long Beach, N. B. is Newport Beach. Adapted from: Haagen-Smit, A. J., "The Air Pollution Problem in Los Angeles." Engineering and Science, December, 1950.

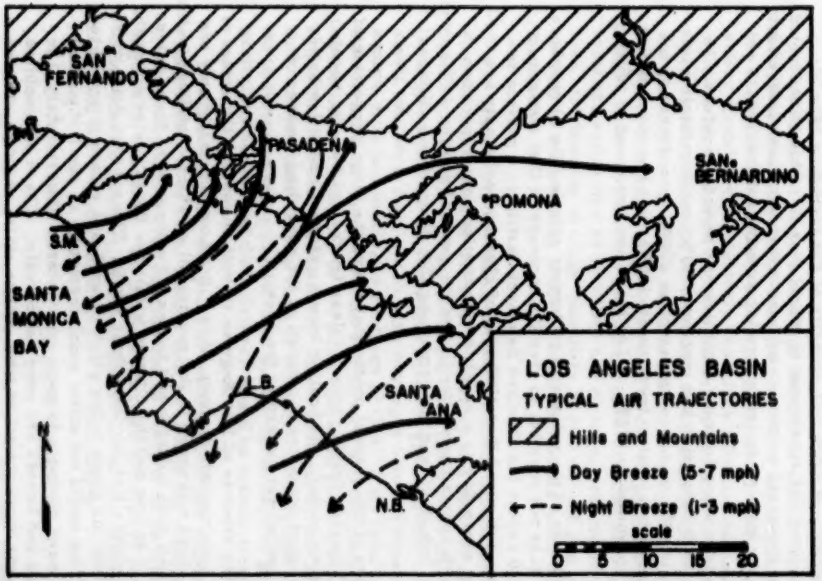

Figure 2. Air Pollution in the Los Angeles Basin is approximately co-extensive with the line bounding the hills and mountains although several areas of lower hills are sometimes completely covered. The area of heaviest concentration, as measured by complaints received, except for just east of Santa Monica, is approximately co-extensive with the areas of densest settlement pattern. The heavy arrows show the passes out of the Basin: Mint Canyon north of San Fernando, Cajon Pass northwest of San Bernardino, and San Gorgonio Pass south of San Bernardino. Adapted from map in: Middleton, Kendrick, and Schwalm. "Smog in the South Coastal Area." California Agriculture, Vol. 4, No. 11 (Nov. 1950)

Man-Made Causes of Smog

From the above description of the natural causes of smog it can be assumed that the phenomenon of smog is not new in Los Angeles. As early as 1582 Juan Cabrillo named Santa Monica Bay "Bahia de los Fumos," the Bay of Smokes.[3] He apparently arrived at a time when grass and brush fires plus an inversion held the smoke close to the earth. However, it is generally agreed that the frequency of smog and severity of eye irritation have increased markedly during and subsequent to World War II. This is undoubtedly true owing to the increased volume of pollutants that have been infused into the atmosphere as the man-made smog forming activities increased.

This increase in smog forming activities has been tremendous. In the ten years 1940-1950 population has increased 30%; motor vehicle registration approximately 50%; gasoline consumption 100%; manufacturing industries (as represented by capital investment) 100%; fuel gas consumption 300%; and fuel oil consumption 500%. All of these are important in causing smog.

Since no estimate of the volume of pollutants entering the atmosphere was made in 1940, it is not possible to give the increase in that statistic. However, in its 1950 report the Stanford Research Institute, a private research organization, estimated that 2000 tons of chemical pollutants are discharged into the air every day as a result of combustion and evaporation.[4] Of the total about 60% comes from activities of the general public; 25% comes from the petroleum industry; and the remaining 15% comes from all other industry.*

The activities of the general public that cause the large proportion of smog ascribed to it include driving automobiles, trucks and busses, burning garden trash and waste paper, and heating homes, stores, and office buildings. For the most part these are the result of the sprawling expanse of settlement and the settlement pattern of the area.

The sprawling expanse of Los Angeles is well known and the extent of its boundaries has been the butt of many jokes. But Los Angeles is only one of 45 incorporated cities and towns in the county, all of which contribute to the smog themselves from both industry and homes. Furthermore, there are so many places in which to live and the climate within the Basin varies so much, that individuals frequently live far from their work. The average daily movement of a worker from his home to his place of work and return is estimated to be 13 miles.[5] This would not affect smog formation so much if public rail transportation were adequate to move commuters. Unfortunately it is not, and automobiles and busses are used extensively. These automobiles and busses plus trucks drive a total of fifty million miles per day. The exhaust fumes from this mileage provide, according to the Stanford Research Institute, 350 tons of pollutants each day.

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* Subsequent to the reading of the paper at the June meeting 1951 a letter was received from Gordon P. Larson, Director of the Los Angeles County Air Pollution Control District which said in part, "... we at the District believe that their (viz. Stanford Research Institute's) percentage figures are false and that using their own estimates, the percentage of blame between the public and industry probably should be just reversed." Nevertheless, the statistics are used here because the Air Pollution Control District has issued no figures of its own.

The large area of easily accessible land that permitted the development of so many towns has another effect that influenced smog formation. With so much land, most houses are built on relatively large plots. Because the climate permits all year gardening, there is a large amount of garden trash to be disposed of. The burning of this garden trash and other household wastes is estimated to send 550 tons of pollutants into the air daily. Together these smog sources attributable to the area's settlement patterns provide some 45% of the total pollutants, more than the total for all industry.

The most important of the industrial sources is considered to be the petroleum industry which contributes 25% of the total chemical pollutants to the air. One of the most significant chemicals emitted by the petroleum is sulfur dioxide, a particularly obnoxious pollutant because in combination with water it forms sulfuric acid. Studies of dust fall in 1948 indicated the heaviest concentrations of sulfur dioxide to be found in the area north and east of the Palos Verdes, where most of the large refineries are located, and in downtown Los Angeles, where many of the office buildings are heated by fuel oil.[6] However, control operations have reduced the sulfur dioxide pollution from the refineries so that they are no longer the major source. Nevertheless, the burning of large quantities of fuel oil and gas in the refining process as well as the refining process itself still sends much chemical pollution into the air.

The relatively small proportion of the pollution from other industrial sources is a result of the type of industry and sources of industrial power used in the area. For the most part our industry is light industry not using in large quantities the fuels that produce great volumes of pollutants. The small total dust fall, which here averages between twenty and forty tons per square mile per month, is evidence of that. This total is considerably less than in many areas where coal and fuel oil are the main power sources. Nevertheless, industry is the main source of particulated matter which is so important in reducing visibility. Measurement by the Air Pollution Control District indicates that on days of reduced visibility there are approximately three times as many particles in the air as on days of good visibility.[7] These particles, because of their nature, would be mainly from industrial sources.

There is only one point of evidence that the pollutants from industrial sources may have other effects than to reduce the visibility. That is that the greatest amount of crop damage due to smog is to be found southeast of the Los Angeles City Center. Because of the concentration of industry in the Central Manufacturing District, which is northwest of this damage area, and the west-east wind movement, there may be a relationship.

Effects of Smog

The effect of smog on agriculture is the only effect of smog on which an economic value can be placed. It has been estimated that loss, due to smog damage, amounted to $480,000 in 1949.[8] Crops known to be affected include spinach, endive, romaine, chard, table and sugar beets, celery, onions, parsley, cress, alfalfa, barley and oats. Many ornamental plants are also affected. Injury to plants occurs within one to three days after heavy smog attacks. The most prevalent type of injury, and that which causes the greatest economic loss, results from an unknown gas or gases which are absorbed by the leaves and cause a dehydration of the leaf from within. Injury to plants has been recorded in an area from Santa Monica to San Bernardino and to south of Newport Beach.

It is felt that if smog should go uncontrolled and become further intensified for several years other economic effects such as a change in the

distributional pattern of industrial and superior residential locations would occur. At present superior residential districts and industrial districts are widely scattered and there is no discernible relationship between their location and smog distribution. Had not the problem of smog been met by organization of the Air Pollution Control District, it is felt that a very distinct shift in land values and hence land usage would, in the course of time, develop.

There have, of course, been several instances when such moves in residence and business locations have already taken place. In the case of a business change, that of the National Dyeing and Finishing Company might be noted. This company, formerly located in the heart of the textile and clothing district in downtown Los Angeles, dyed and finished fabrics for use of its immediate neighbors. When fire destroyed its plant two years ago it relocated in Culver City, several miles to the west. Although now quite far from its supply and marketing district, the management finds the move justified. The basis of its decision to move was the smog. On several occasions chemicals in the smog had adversely affected the color of a dyed material with considerable economic loss. Another major point was eye irritation; workers in the plant are no longer affected by eye irritation and its concomitant inefficiency.

The eye irritation, so far as is known, has had no ill effects on the eyes subsequent to the smog attack. When the irritation occurs it is annoying, and reduces efficiency on precision eye work, but there is no permanent eye damage. The question as to the permanent effects on lungs and general health is still open. The members of the Los Angeles County Medical Association were polled and the concensus was that smog is a contributing factor to ill health. The County Board of Supervisors as a result of this disclosure created a Medical Research Commission to conduct research into the effects of smog on the health of local residents.

It would normally be expected that the bad publicity our smog has received would decrease the attractiveness of the area for new industry and permanent in-migrants. Yet this has not been the case. In both there has been an increase since the end of World War II. From 1946 to 1950, some 982 new industrial plants have located here and in-migrants have increased the population by approximately 375,000.

Control of Smog

As mentioned previously, the effects of smog would have been much greater had not the Los Angeles County Air Pollution Control District been organized. This organization was set up in 1948 under a state enabling act permitting the creation and outlining the powers of such control districts. Because no other industrial area in the world has the precise problems of this one, the first operations were to determine the scope of the problem and to develop an approach to its solution.

The approach, as finally worked out, has been to control the contaminants at their source. To do this, studies of the factors involved in air pollution have been constantly carried on. When a specific pollutant and its originator have been identified, steps are taken to eliminate the pollution. The enabling act, under which it was organized, gives the Control District extensive powers to force offenders to reduce pollution by installing special equipment. Much of the equipment, because of the small size and the type of pollutants, has had to be designed especially for the particular offender. In general, the process has been to cool the waste smoke and gases and to lead them through collecting devices which force the particles to drop out. Such

devices as electrostatic precipitators, bag houses, water sprays, centrifuges and scrubbers are in use.

In several instances the device installed has enabled the installing industry to make a profit on the removal of pollutants. That of the oil companies in removing sulphur dioxide is noteworthy. By collecting the gas and refining it, pure sulfur to the extent of some 170 tons per day are obtained, while at the same time the amount of SO_2 that goes into the air from the refining plants has been reduced 77%. Many other instances of a similar nature have occurred and the Control District fully expects that more will occur. In fact, they feel that industrial engineers will find profitable uses for previous waste gases so that greater efforts will be made to remove them from the air without the prodding of the Control District.

However, the public emissions of contaminants have not been attacked with the same vigor as have the industrial emissions. It is virtually impossible to require each householder to install expensive equipment to control pollution from his gas furnace or backyard incinerator. It has been proposed that a series of municipal incinerators, which can be controlled, be built. A few cities have done so, but a large majority of the cities and towns in the Control District have not.

Nor can much be done about the emissions from automobiles and busses. It is true that Beverly Hills has passed an ordinance prohibiting the driving of cars that smoke excessively, but the problem here is a difficult one.

Nevertheless, the Los Angeles County Air Pollution Control District has been able to announce a daily reduction of the emissions from 1948 to 1950 by 35% and statistics of the Weather Bureau show an average increase of visibility of 25% during the same period. Criticism has been raised that the climatic and meteorological conditions in 1950 were less favorable for smog formation than in 1948 (the worst year), yet it is noted that in 1948 an inversion of 1500 feet was favorable to eye smarting smog, while in 1950 an inversion of 1000 feet was necessary for the same condition.

Conclusions

The reduction in smoggy days after the inception of the Smog Control District does not mean that there can or will be a constant reduction until our air here is completely smog free. The meteorologic, climatic, and topographic conditions in the Los Angeles Basin are such that pollution of the atmosphere will continue during certain periods of the year within the area. Nevertheless, constant study applied to the pollutants and means of reducing them should make the Los Angeles Basin a more pleasant place than it has been during the past few years.

LITERATURE CITED

1. Haagen-Smit, A. J., "The Air Pollution Problem in Los Angeles." Engineering and Science, December, 1950.

2. Mills, C. A., "Donora Smog Disaster." Hygeia, vol. 27 (Oct., 1949) pp. 684-85.

3. U. S. Engineering Department, Report upon United States Geographical Surveys West of the One Hundredth Meridian. In charge of George M. Wheeler. Vol. VII, Archeology. Washington, D. C., 1879, p. 306.

4. Stanford Research Institute, Third Interim Report on the Smog Problem in Los Angeles County. Western Oil and Gas Association, Los Angeles, November, 1950.

5. California Railroad Commission. Los Angeles and Vicinity: Results of Emergency Transportation Survey of April, 1942.

6. Map "Lines of Equal Concentration of Acidity," Los Angeles County Air Pollution Control District Annual Report, 1948-49, p. 25.

7. Air Pollution Control District, County of Los Angeles, "Technical and Administrative Report on Air Pollution Control in Los Angeles County," Annual Report, 1949-50, p. 23.

8. Middleton, J. T., Kendrick, J. B., Jr., and Schwalm, H. W., "Smog in the South Coastal Area," California Agriculture, volume 4, No. 11 (Nov., 1950), p. 7.

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FORREST SHREVE, 1878 1950

Forrest Shreve, president of the Association of Pacific Coast Geographers in 1941-42, died in Tucson, Arizona July 19, 1950 at the age of 72. Born in Maryland, he studied at The Johns Hopkins University and received the Ph. D. degree in 1905. He was a staff member of the department of botanical research, Carnegie Institution of Washington, 1908-27, and in charge of desert investigations since 1928. He was editor of the "Plant World," the predecessor of "Ecology" from 1911-19. He was publication editor of "Naturalist's Guide to the Americas."

Dr. Shreve was a botanist with a wide range of interest. The subjects he studied included the ecology and physiology of the montane rain forests of Jamaica, climate of mountains, climate and distribution of vegetation, radial growth of trees and its conditions, plant ecology of the coastal ranges of California, climates of American and Mexican deserts, and ecology, water economy, and distribution of desert plants and desert vegetation in the southwestern United States and in northern Mexico.

Nearly all of Dr. Shreve's studies aimed to elucidate the relationship of the plants to their natural environment, particularly the adjustment of the desert vegetation to the special factors and conditions of the arid regions of the Southwest and neighboring Mexico. He studied the plants under natural conditions, in the field. Many of the investigations dealt directly with plant geographical problems. He contributed papers to the Yearbooks 6 and 8 of the Association.

In 1909 Dr. Shreve married Edith Bellamy, a prominent plant physiologist.

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WARREN DUPRÉ SMITH, 1880-1950

Oregon lost one of its best known and beloved geographer-geologists when Warren Dupré Smith passed away, on July 18, 1950, at his home in Eugene. Warren Smith was born in Leipzig, Germany, on May 12, 1880. He received the Ph. D. in geology from the University of Wisconsin in 1908. For eleven years he worked in the Philippine Islands as a geologist for the Bureau of Mines. In 1914 Warren Smith came to the University of Oregon as Professor and Head of the Department, a position he held until his retirement in 1947. During his period of service in the University or Oregon, Professor Smith took time out for travel to Europe, the Orient, and South America. He was a member of many scientific societies, including the Association of Pacific Coast Geographers and the Geological Society of America. During the period 1905-1946, Warren Smith published nearly 100 books and articles, most of which were concerned with the geology and geography of the Philippines and the state of Oregon.

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CLARENCE K. STUDLEY, 1877-1951

Clarence Knight Studley played an important part in the development of his community, his college, and his chosen field, geography. For forty years he taught science and geography at Chico State College, and for many years served as Dean and Vice President. He can be called the father of college geography in far northern California.

He was born in Adin, Modoc County, and died in Chico, having spent most of his life in northern California. He graduated from Stanford University and received his M.S. degree at Berkeley. After a brief period of teaching at Lompoc and Chico High Schools, he joined the faculty of Chico State College, where he remained from 1907 until his retirement in 1946.

In 1929, when he brought to Chico a full-time geographer, Peveril Meigs, he gave the young newcomer a free hand to develop the geography program, and confined his own teaching to geology and meteorology. The time-consuming administrative burdens of his later years never weakened his interest in geography, and he gave invaluable support to the geography program during the lean depression 30's. During World War II he undertook to teach single-handedly enough geography courses to maintain the continuity of the work at the college.

At all times "C. K.", as he was affectionately known, lived a simple upright life, steadfastly setting for himself the highest principles of conduct and even abstemiousness, yet conceding to others the right to live their lives in their own way. Among other community and college activities he originated the college summer school conducted at the base of Mt. Shasta for a number of years. The Chico Lions Club, of which he was a long-time member, has created a scholarship in his honor. He is survived by his wife and three children.

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THE ASSOCIATION OF PACIFIC COAST GEOGRAPHERS

Fourteenth Annual Meeting

Los Angeles, California, June 21-23, 1951

The fourteenth annual meeting of the Association was held at the University of Southern California, Los Angeles, in connection with the annual meeting of the Pacific Division, American Association for the Advancement of Science. Four half-day sessions were allotted to the presentation of papers, while two field excursions occupied June 23. A business meeting was held at the close of the morning session on June 22. The address of the retiring president was given at the annual dinner meeting held in University Commons on the evening of June 21.

Program, with Abstracts of Papers Presented

(Papers published in full in this issue are not abstracted here)

THURSDAY MORNING SESSION, JUNE 21

Fresno County's Agriculture Related to Soils and the Availability and Quality of Irrigation Water. CHESTER F. COLE, Fresno State College.

Abstract: Fresno County is probably the leading producer of agricultural products, by value, in the United States. The agricultural area of Fresno County lies in the San Joaquin Basin, bounded on the east by the foothills of the Sierra Nevadas and on the west by the foothills of the Coast Ranges. About 60 per cent of the area studied is devoted to irrigated crops, 18 per cent to dry native pasture, 2 per cent to dry farmed grains, 11 per cent to idle crop land, 3 per cent to irrigated pasture, and 6 per cent to towns, and various rights-of-way.

Soils are all alluvial. West of the axis of the San Joaquin Basin the soils have been derived from calcareous-gypsiferous sediments; east of the axis soils have been derived from predominantly granitic sediments. The valley trough has soils derived from mixed sediments. Along the Sierra Nevada foothills are old terrace soils, mainly planosols. Astride the valley axis are basin soils -- mainly wiesenbodens, adjacent to which, at slightly higher elevation, are basin rim soils -- solonetz and solonchak to the east and mainly solonchak to the west. Between the basin rim and terrace soils on the east are the alluvial fan soils, generally of recent origin, some of which have been modified by wind action and are generally alkali free, except in depressions. At the base of the Coast Range foothills are a few localities of old terrace soils. Between these and the basin rim soils west of the valley axis are young, fertile alluvial fan soils.

The eastern terrace soils are devoted mainly to dry farmed grain with small acreages of citrus fruits or figs; lack of ground-water eliminates extensive irrigated agriculture. The eastern alluvial fan soils are devoted mainly to grapes with some deciduous and sub-tropical tree fruits and minor amounts of cotton, alfalfa, and irrigated pasture. Here "fresh" gravity water from the Kings River and the shallow depth of ground-water make possible extensive irrigation. The eastern basin rim soils, where not excessively affected with alkali, are devoted to cotton, alfalfa, and irrigated pasture. No tree or vine fruits are found because of their poor tolerance of salt. Where alkali is present in great amounts, only natural pasture exists.

The heavy textured basin soils along the valley axis are usually only slightly affected with alkali. Cotton, barley, and alfalfa are the main crops. But irrigated pasture, alfalfa, rice and truck crops also are important. Ground water quality varies strongly. Some gravity water from the Kings and San Joaquin rivers makes possible a wide variety of crops. Fruits are not grown because of their poor tolerance of salt and because of low spring air and soil temperatures.

The basin rim soils west of the valley trough, the western alluvial fan soils, and the low terraces are devoted to irrigated field crops and some truck crops. Field crops are mainly barley and cotton with small acreages of flax, safflower, wheat and sugar beets. Truck crops are mainly melons and carrots.

Only in the northwestern part of the county is gravity water available for the west side soils. It is of poor quality and must be pumped from levels of 300 to 600 feet. Thus only salt tolerant crops can be grown.

Highly productive and profitable irrigated agriculture is dependent upon a continued and increased supply of gravity water which it is hoped will be supplied by the Central Valley Project.

The Los Angeles Freeway System. LAWRENCE THOMPSON, University of Southern California.

Abstract: It was essential that Los Angeles acquire the integrated freeway system now under construction. The explosive population growth of metropolitan Los Angeles has placed a burden upon an antiquated highway system that can be overcome only through application of a new concept of widespread transpenetration and peripheral linkage.

Topography, existing urban configurations, and distribution of outlying communities influenced the selected pattern for the freeway system, with its three main north-south and three main east-west units. Integrated with and complementing other types of mass surface transportation, the freeways will relieve much local traffic congestion.

The billion-dollar project must include, through regional planning, the economic re-orientation of the Los Angeles Lowlands to minimize unwise land use. The tearing down and replacement of large portions of central Los Angeles can thus progress with a new concept of planned space, including zones for parks, public buildings, and commercial and industrial districts. The peripheral area, though widely separated, needs to be more closely integrated. Trans-penetration will obviate the type of metropolitan agglomeration that exists in older cities.

Sugar Beet Growing in Ada and Canyon Counties, Idaho. KENNETH J. WILLIAMS, Boise Junior College.

Abstract: Ada and Canyon Counties are located in the southwestern section of Idaho. They are the core of a sugar beet area referred to as the Nyssa-Nampa district, composed of six counties in Idaho and one county in Oregon.

The sugar beet industry has had a difficult time because of the curley-top disease. In 1910, sugar beet growing began, but within a few years it

disappeared because the disease took the upper hand. But in 1936, a seed was grown which resisted the curley-top disease. Then in 1937, the Amalgamated Sugar Company of Ogden, Utah, contracted for 5,200 acres and received an average yield of 12.2 tons per acre, paying each farmer $5.24 per ton for his beets. This was the beginning of today's commercial industry, which has increased to a point where, in 1949, there were 30,320 acres contracted with an average yield of 21.8 tons per acre for which the sugar company paid the farmers $12.75 per ton.

The sugar beet is a crop which has a market within the growing area. The refining of sugar produces a type of product which can be shipped to all markets easily because of its concentrated nature. Future production should continue close to the 1949 level, as this industry is becoming stable. It will require effective cooperation between the farmers and the Amalgamated Sugar Company, or the yields will decrease. This paper was published in full in the Pacific Northwest Quarterly, July, 1951.

Altitude: Its Role in the Geography of Man in the High Peruvian Sierra. C. LANGDON WHITE, Stanford University.

Abstract: The central Andes have been unique among the world's high mountain environments in having cradled an extremely high civilization -- the Incan. In this region at altitudes varying from 10,000 to 16,000 feet, man has lived close to Nature. Here for centuries have dwelt millions of persons at altitudes so high that their physiological processes afford a field of study far superior to any other thus far examined by medical science. Theoretically, the terrain, climate, soils and vegetation of the Andes would appear to be fit for producing and sustaining only a backward, poverty-stricken people. Everything here was inferior but man himself!

What kind of a person is the highland Indian of today? He is about 61 inches in stature, with a barrel-like chest all out of proportion to his stature. The breadth of his chest is about 10 per cent greater than that of a white man. He has about two quarts more blood than a lowlander, and has more red blood corpuscles -- 6,500,000 per cubic mm. of blood at Morococha, altitude 14,900 feet -- than does the lowlander with 5,500,000. His heart is longer and thicker, beats more slowly and can do 20 per cent more work. His respiratory rate is slightly increased over that of the lowlander. Accordingly, the mountain Indian is acclimatized. He occupies high areas under normal conditions at an oxygen pressure of 85 mm. rather than the 150 mm. at sea level. He can and he does, however, get soroche or mountain sickness when he ventures up to the snowline, some distance above his customary habitat. That he is a true mountain man is indicated by the fact that he does not adjust well to sea level conditions -- becoming predisposed to diseases of the lungs.

From the standpoint of human ecology or geography, the acclimatization of the Indian is important, because man's use of the sierra, which comprises 40 per cent of the area of Peru, must necessarily depend upon the Indian and the Cholo (mixed blood). Farming, stockraising, mining and carrying all are performed by the Indian and the Cholo -- the latter a new ethnic type that is acquiring the original ancestral qualities. The more Indian blood an individual has, when living in the Andes, the better he gets along, so far as normal living is concerned. In fact, Carlos Monge, Director, Institute of Andean Biology, asserts there is no longer, biologically speaking, a white race in Peru's high elevations.

When Pizarro and his conquistadores went into the sierra, they were definitely affected by the altitude. Many became sterile as did most of their domestic animals. This was a major reason for moving the capital in 1639 from Jauja (13,000 feet) to Lima (almost at sea level). It is significant that at the great silver-mining city of Potosi, a city of 100,000 natives and 20,000 Spaniards in the early 1600's, few white children were born and not one survived during the first 53 years of the city's existence; the Indians, on the other hand, went right on reproducing normally. It accordingly became the custom of Spanish mothers to go to the valleys at some distance from the city to give birth to their children and not to return until the babies were six months or more old. Pregnant white women at Cerro de Pasco and other mining centers today go down to Lima to have their babies.

It can be concluded that the white man appears to have no future in the high sierra; though some of his numbers may become fairly well adapted to the deficiency of oxygen, no white man is able to perform heavy labor. The highland is Indian country as it has been for centuries and as it promises to be for centuries more. The highland Indian is believed to belong to a special climatophysiological variety of the human race, his biological characteristics differing somewhat from those of sea level man.

Re-Settlement Programs to Relieve Population Pressure in Java. ANTHONY SAS, University of Washington.

Abstract: The rapid acceleration of the rate of population increase in Java after 1850 may be attributed largely to the restoration of peace and order by the Dutch and the concentration of their economic activities in Java. Compared to an estimate in 1850 of 10 million people in Java/Madura and 5 million in the rest of Indonesia, 1949 statistics show a population of 51 million in Java/Mandura and 21 million in the Outer Territories, with a respective distribution of 999 people and 24 people per square mile.

Realizing the dangers of over-population in this predominantly agricultural area, the Dutch Colonial Government took various steps to relieve pressure in the most congested areas, one of the foremost being a colonization scheme to promote migration of Javanese to the Outer Territories. The first plan was launched in 1905, when two colonies were founded in the Lampong Districts in South Sumatra. This plan was not an overwhelming success, owing to an excess of government aid to migrants, poor selection of colonists, and ill-chosen sites. By 1928, only 24,000 persons were living in the two colonies.

Accordingly, the government altered its policy, restricting financial aid to minimum needs and making a more discriminating choice of colonists and colony sites. New colonies were founded as the existing ones reached capacity and at the eve of the outbreak of hostilities in the Pacific, the total number of Javanese colonists in the Outer Territories amounted to 115,000, the majority residing in the Lampong Districts.

During the Second World War and the subsequent period of internal strife in Indonesia, migration from Java was negligible. However, neither the Dutch nor the Indonesian officials had overlooked the urgency of Java's population problem. This is evident in that both sides were instrumental in completing by February, 1950, the drafting of a five-year plan for transmigration of certain population groups from Java to areas elsewhere in Indonesia. This plan provides for migration of 563,000 Javanese, and states the requirements which the migrants and the colony sites must meet.

Although transmigration can provide temporary relief, it constitutes treating the symptoms without removing the cause. To remove the cause, there is an urgent need for an intensive education program, directed toward birth control.

Notes on Small Area Studies Illustrated by Oregon's McKenzie Valley. SAMUEL N. DICKEN, University of Oregon.

Abstract: It has been customary for geographers to make sample studies of small areas to represent larger regions under the name of "type studies," "micro-geography," or other similar designations. The area covered by such studies ranges from a small farm or market place up to several square miles. Oregon's McKenzie Valley, in the Western Cascades, can be represented by three "small areas" of a few square miles each. It seems desirable, in using the "small area" method, to make less intensive studies of the larger region and establish a hierarchy of integrated levels in regional study. The lowest level is the "landscape" which requires intensive study on a scale comparable to the average air photo. One or more "landscapes" represent a "district" (McKenzie Valley) with a scale of the average topographic map. Next is the "province" (the Western Cascades) and after that the "realm" (the Pacific Slope).

Soviet Territorial Annexations in Eastern Europe. HUEY LOUIS KOSTANICK, University of California, Los Angeles. Published in full in this issue.

THURSDAY AFTERNOON SESSION, JUNE 21

Vernon, California, An Incorporated Industrial City. HOWARD J. NELSON, University of California, Los Angeles.

Abstract: This study is, first, an attempt to understand urban patterns in the city of Vernon and adjacent areas and, secondly, an effort to assess in a sample area the effect of local political boundaries on land use within a metropolitan complex.

Vernon is one of forty-five cities in the Los Angeles Urban Area. Though small, with an area of about four square miles and a population of 417, it is industrially important, for an estimated 60,000 persons are employed in its manufacturing and wholesale establishments. In Vernon's landscape there is almost no residential, commercial or public land. Instead factories, warehouses, wholesale establishments, truck terminals and a dense rail-net dominate the built up area of Vernon to an extent perhaps unequalled in any city in the United States. However, immediately surrounding Vernon lie other cities, as well as blocks of unincorporated county territory, with about "normal" population densities, and early "average" proportions of land used for residential, commercial and public purposes.

No variations exist in physical qualities, or pre-conquest, Spanish or early American occupance, to throw light on the present differentiations in land use. Only when Vernon was incorporated in 1905 did significant differences appear in an otherwise homogeneous area. At that time local ordinances made possible some unique developments. Though industry was encouraged and present from the first, Vernon's fame during its first decade was a sporting town. After the first World War industry displaced the saloons and boxing arenas, and has continued a steady growth to the present day. The desirability of a close-in location and good rail facilities have been magnified by low city

taxes and a governmental attitude friendly toward industry. Further reinforcing the idea that in Vernon political factors are important is the fact that in numerous occasions sharp breaks in land use coincide exactly with the city's boundary.

We can safely conclude that in this area local political patterns are highly significant in understanding urban land use. Vernon's future depends on the extent to which it is able to maintain its present political qualities. The probabilities are that in the predictable future, the next decade or two, it will be able to maintain them.

The Sardine Industry of San Pedro, California. DAVID A. GARRETT, University of Southern California.

Abstract: San Pedro has the nation's largest sardine industry, involving 4000 fishermen, a purse seine fleet of over 150 vessels, and 20 processing plants.

Fishermen operate from November through March at fishing grounds off the Southern California coast. The sardine fleet reaches the fishing grounds when darkness falls. When a school is detected, a boat extends its purse seine, surrounding the fish. After the catch has been placed in the brine-filled hold, the vessel returns to port. At the cannery wharf conveyors transfer the sardines into the plant, where they are weighed, scaled, cut and cleaned, cooked and canned. The mechanized cannery process requires approximately three hours, with a minimum of hand labor.

The pack is shipped to market via trucks, trains, and freighters. Principal outlets are in Southeastern Asia, where fish and rice form major items in the diet. The recent decline of the Chinese market has prompted efforts to increase domestic sales.

The United States government recognizes the value of the sardine industry; hence measures will undoubtedly be made for its continuation. The industry's prospects seem bright, with an expanding domestic demand and a steady export market.

Adjustments to Declining Water Resources in the Antelope Valley, California. RUTH E. BAUGH, University of California, Los Angeles.

Abstract: Agriculture has always been the basis of Antelope Valley economy and the hay, grain, deciduous fruits and poultry products have found a ready market in nearby Los Angeles. Alfalfa is the most important crop. Its cultivation is encouraged by the high summer temperatures and low humidity of this desert basin, and by the far-reaching demands for hay in the Los Angeles milkshed.

The irrigation requirements of alfalfa are heavy and threaten early exhaustion of underground water resources. The continued overdraft by pumping and the lack of recharge owing to a decade of subnormal precipitation have resulted in an alarming drop in water levels, a shrinkage which now averages three to four feet annually. Drastic curtailment in use of water is now imperative.

Recently constructive practices in the conservation of water and soil have been introduced by the Antelope Valley Soil Conservation Service.

Contour cultivation, strip cropping, use of drought resistant grasses, improved methods of water application and of tillage give promise of curtailing the consumption of water. Check dams and flood control works are being installed.

Experiments with crops having low water requirements are proving successful at the University of California Field Station located near Palmdale. Field and sweet corn, milo maize, Sudan grass, castor beans, sugar beets and various seed crops, particularly alfalfa seed, are well adapted to Valley conditions and their production promises profitable returns.

The temporary solution of the water problem would seem to depend on continuing practices of good conservation, and the increasing employment of wise diversification.

On Summer Dry Climates. HARRY P. BAILEY, Los Angeles State College.

Abstract: Most of the land area of the world receives more precipitation in the summer half of the year than it does in the winter half. In mid-latitude oceanic areas the relation is reversed: a winter maximum of precipitation prevails. This marine characteristic is carried over to terrestrial areas in subtropical latitudes, where, along the western borders of the continents almost complete suppression of summer rain is exercised.

In the case of the United States, rains are light in summer along the entire Pacific Coast. Throughout the physiographic division of the Pacific Mountain System less than 30 per cent of the annual precipitation falls in the six warmer months of the year (April-September). Only 50 per cent falls in the same period as far inland as the approaches to the Rocky Mountains.

Copious precipitation occurs in the winter on some mountain slopes facing toward the sea, a condition attributed to orographic modification of traveling cyclones. Decrease of winter precipitation inland is attributed in part to rain-shadow effects of coastal mountains, but maps of rainfall intensity indicate that many storms are too weak to affect the interior at all. Stalling of storms along the continental boundary has probably little relation to terrain, but is caused chiefly by continental pressure conditions.

Summer conditions are quite different. Dominant high pressure cells over the Pacific and Atlantic contribute to the drouth of our far West. Not only do these cells keep migrating storms of the westerlies well to the north of their winter paths, but they also act to restrain moist marine air from crossing the Pacific Coast. The latter restriction is imposed on surface air by the Pacific HIGH, which brings cool air from the north parallel to the coast. Air at depth over the Pacific border is also dry, having been warmed by descent within the high pressure cells. Air aloft of Atlantic origin is occasionally moist enough to allow scattered thundershower activity in the summer-dry region, but the normal stratification of temperature and moisture is one of unfavorable environment to the precipitation process.

The winter condition of storm has been analyzed by Willett in terms of slight pressure difference between subtropical latitudes and the circumpolar region, and so is classed as low-index circulation. The summer condition of drouth is related to the growth of the subtropical high pressure cells at the expense of the circumpolar lows, and so is classed as high-index circulation. Change in index of circulation is not only cyclic according to season, but must also be secular in nature if glacial periods are to be accounted for.

Summer-dry climates, as they are now distributed, are sensitive indicators of climatic change because of exceptional suppression of precipitation by high-index circulation. In keeping with that fact is the circumstance that, of all the major hydrologic divisions of the United States, that of the Southwest is the only division revealing a clear trend in stream flow. The trend is downward, and must reflect significant climatic change.

Los Angeles Smog. JOHN W. REITH, University of Southern California. Published in full in this issue.

Geographic Background of Spanish Grants, Taos County, New Mexico. V. CALVON McKIM, Fresno State College.

Abstract: Taos County has natural homogeneity in its flat plateau, rolling to rough piedmont and bordering mountains. Historically the most important part of the county is Taos Valley. The Rio Grande in contrast to most rivers is a greater barrier than the mountains. This influence of the river extends to the southern boundary of the county. On the north just across the State Line in Colorado its arroyo becomes so narrow and shallow that only small bridges are required to span it from rim to rim. The Sangre de Cristo Piedmont and Mountains contain most of the population of the county, as well as most of the water, wood and grass of the area. These two regions are of greatest economic significance to the whole county.

In the Picuris Mountain region there are three small valleys on tributaries of Embudo Creek, which are settlement centers. The Rio Grande Plateau occupies the portion of the county west of the river. It offers little opportunity for agricultural pursuits. Its importance will increase upon completion of the Chiflo Dam, a project still in the planning stage.

The Background for preservation of Spanish Grant influence on present day land use is attributed to isolation not only by the natural backgrounds in Taos County but also in the continuation of its mountains into Colorado. The paucity of low passes caused railroads to skirt the area and highway construction to be delayed.

Steep grades, poor bridges, and unsurfaced roads have tended to keep Taos County more or less static, and preserved a way of life rapidly vanishing elsewhere in the United States. It is anticipated that the work begun in this paper will serve as a basis for correlating the influence of the Spanish Grants, some made as long as 300 years ago, on present day use patterns and other cultural aspects that may come to light.

Methods of Estimating Normal Rainfall. LAWRENCE ERHART, Fresno State College. No Abstract received.

The Dalmatian Element in the Population of New Zealand. ALBERT W. SMITH, University of Washington.

Abstract: The Dominion of New Zealand is noted for the homogeneity of its population, and 98.97 per cent of the people can claim some part of the British Commonwealth as their birthplace. In such a dominantly British population, any foreign group, regardless of size, is especially conspicuous. At the last complete census in 1936, the Dalmatians were the largest group,

accounting for one-fifth of the total foreign-born population.

The number of foreign-born Dalmatians appears small in the total population but it is conspicuously concentrated in the warmest part of the country, in Auckland Province in the northwest of the North Island. Within the rural parts of Auckland Province live 2400 of the 2700 Dalmatian-born residents. In some of the northern counties, as much as five to eight per cent of the inhabitants are Dalmatian-born.

The possibility of "striking it rich" on the desolate kauri-gum fields of North Auckland originally attracted the majority of Dalmatians to the Dominion. By 1900, they dominated the Kauri-gum industry, more than 2500 being employed on the northern gumfields. In 1917, more than one half of the gum-diggers were of Dalmatian birth.

After World War I, the Kauri-gum industry suffered a loss of markets from which it has never fully recovered. Although attracted to all sorts of substitute occupations, the concentration of Dalmatians in dairy farming, orcharding, viticulture, the retail fish trade, and the restaurant business is noticeable. The Dalmatians have tended to remain and to settle in the mildest part of the country where they can follow an Adriatic type of horticulture.

The cultural impact of the Dalmatian upon New Zealand has been negligible. This group was neither sufficiently large nor dynamic to make any appreciable contribution to New Zealand culture, even in Auckland Province where they are most numerous. It is indeed true that they are an energetic, industrious and law-abiding people and have contributed much to the agricultural and economic development of New Zealand's "Far North." However, in the near future only their names will serve as a reminder that they were once the largest minority group in the Dominion.

THURSDAY EVENING SESSION, JUNE 21

Annual Dinner, University Commons, University of Southern California. Address of the retiring President: "The Development and Status of Geography in Universities and Government in Canada." J. LEWIS ROBINSON, University of British Columbia.

FRIDAY MORNING SESSION, JUNE 22

A Phytogeographical Transect of the Southern San Francisco Peninsula.

ROBERT W. NEWCOMB, University of California, Los Angeles.

Abstract: Within a compact, accessible area the San Francisco Peninsula provides a summary representation of the vegetation communities of Coastal California. Roughly outlined "belts" of vegetation extend north and south on the Peninsula, their alignment having been affected by topographical and climatological factors. Although optimum development of the communities is not achieved here, the dominant species occur and the appearance of each unit is characteristic. The Coastal Sage, a scrub unit occurring on the coastal bluffs and coastal foothills, contains Artemisia californica, Baccharis pilularis, and Salvia spp. as chief constituents. Sequoia sempervirens, Pseudotsuga douglasi, and Woodland elements in the understory constitute the North Coastal Forest, which covers the western and eastern slopes of the Santa Cruz Mountains. Woodland, a community of the eastern mountain slopes, is dominated by the broad-leaf sclerophyll oaks, madrone (Arbutus menziesii), and

tanoak (Lithocarpus densiflorus). Shrubs such as giant chinquapin (Castanopsis chrysophylla), toyon (Photinia arbutifolia), and California buckeye (Aesculus californica) produce a tangled Woodland undergrowth. The botanically complex Chaparral community composed of chamise (Adenostoma fasciculatum), scrub oak (Quercus dumosa), manzanitas (Arctostaphylos spp.), and Ceanothus spp. occurs most widely on the eastern slopes of the mountains. Several sub-units such as the Chamise Chaparral, Woodland Chaparral, and Chaparral-Coastal Sage are distinguishable within the overall category of Chaparral. Grassland is widely and disjunctly distributed over the Peninsula, the result of natural factors of plant distribution and human settlement use of fire and land clearing. Native grasses such as Stipa pulchra, Stipa eminens, and Poa scabrella along with the introduced Mediterranean grasses Avena barbata, Avena fatua, and Bromus rigidus and forbs produce the Grassland cover. Salt Marshland pickleweed (Salicornia ambigua), salt grass (Distichlis spicata), and brass buttons (Cotula coronopifolia) occupy the low, poorly-drained lands marginal to San Francisco Bay and at the mouths of the largest coastal stream valleys. Disruption of these vegetation units by fire, land clearing, and logging, all products of human settlement within the area, have influenced the species content of each unit and imparted a rather spotty, disjunct character to the pattern of vegetation upon the Peninsula.

The Impact of Disease upon the Hawaiian Islanders: A Study in Medical Geography. J. A. MYERSON and J. E. SPENCER, University of California, Los Angeles.

Abstract: Depopulation of native races under the impact of occidental culture has happened in all parts of the Pacific Basin. The Hawaiian Islands were selected for a sample study of the role of disease in this process of depopulation. While the evidence is not absolutely trustworthy, early records indicate a population of 200,000 to 300,000 people for the Hawaiian Islands in 1778 when discovered by Captain Cook. This Polynesian strain, as an unadulterated group, has been reduced to some 10,000 in the short space of a century and a half. After discovery the islands became a crossroads fuel-food-water station in Pacific Ocean shipping, causing the introduction of many new items of culture. While the islands have not been totally free of physical ailments previously, new diseases were among the most potent of the culture imports. Disease after disease struck the island natives as an epidemic -- plague, measles, whooping cough, influenza, smallpox, typhoid fever, dysentery being the more serious ones -- each taking its toll in deaths. Syphilis was introduced very early and, while not normally fatal, it seriously disturbed birth and fecundity rates. Other types of diseases also were brought into the islands, to contribute to ill health and act as lesser causes of depopulation, while many new cultural practices helped to create conditions favorable to disease.

The introduction of new medical and public health control measures in the latter part of the 19th century, increasing steadily in efficiency, have prevented the total disappearance of Polynesian Hawaiians, who now number about 10,000. Additional numbers of Hawaiians represent varied racial mixtures. Elsewhere in the Pacific native populations are on the rise again, but there is a real question whether the Hawaiians will be able to preserve their physical identity or be submerged in the oriental and occidental elements now dominating the population structure of the islands.

The impact of disease does seem to be a chief cause of native Hawaiian depopulation, and yet there are a number of other cultural factors that have apparently contributed to the decrease so that disease cannot be described as the sole cause of depopulation.

The Cuyama: Land of Dramatic Change. RICHARD F. LOGAN, University of California, Los Angeles.

Abstract: The Upper Cuyama Valley is a large mountain-girt basin at the intersection of San Luis Obispo, Santa Barbara and Ventura Counties, California. On the north, the barren Caliente Range is intensely dissected by steep gullies. The greater precipitation of the higher ranges to the south has resulted in crestline coniferous forests and chaparral on the slopes. Great fans built out from their bases have submerged the whole valley under alluvium. The very low rainfall of the valley bottom supports only scanty vegetation.

Until the last decade, the area underwent only slow changes. About the middle of the nineteenth century, Spanish cattlemen settled on large grants in the valley bottom. Thirty years later, Anglo-Saxons homesteaded in the canyon mouths at the edge of the Spanish grants, dry farming wheat and barley on the higher fans and running cattle in the hills.

In 1941, wells struck abundant water in the valley bottom and agriculture (potatoes, sugar beets, and alfalfa) invaded the ranches. In 1948, oil was struck, and today, the Cuyama is the fifth California field in production. The result: prosperity for some of the foothill homesteaders, roads into heretofore inaccessible areas, residential subdivisions, booming retail centers, tank farms, supply yards and two large refineries. These all are facets of a variety of dramatic change affecting a region that had lagged behind other parts of California.

The Dynamic Aspects of Geography. HENRY J. WARMAN, Clark University.

Abstract: Under the paper's first subtitle "The Life Layer" the sphericity of our dwelling, with its concentric layers of rock, water and air, is treated in the light of man's efforts and alterations to fit into the changing layers. The "man-land concept" consequently grows from such a treatment. This is the title of the second part of the paper. The dynamic aspect is discussed by viewing this concept as a continually changing relationship. The connotations of adjustment to environment although important need to go much farther than they have, particularly in including sets of values for dynamic societies. The third subtitle "The Circulations," continues to stress movement -- of planets, air, water, cycles of erosion, areas of increment and surplus, spread of knowledge and ideas. The final subtitle "The Human Dynamo" calls for more critical study of the individual, for he changes also, along with the environment complex. The dynamics of geography are renewed increasingly and are of endless diversity. Effort is needed to check the diversity feature from weakening the central bonds of unity inherent in a dynamic approach including "life-layer," the "man-land concept" and the "great circulations," plus more complete focusing of attention on man himself.

A New Administration for the Trust Territory. J. L. TAYLOR, Director of Education, High Commissioner of the Trust Territory.

Abstract: The administration of the Trust Territory of the Pacific Islands (the Marshall, Caroline and Marianna Islands in the west central Pacific Ocean) was transferred from the Department of the Navy to the Department of the Interior on 1 July, 1951. For the most part the administrative procedures and techniques practiced by the Navy since 1944 will be continued by the Interior Department.

The Trusteeship Agreement made with the United Nations Security Council grants the United States full powers of administration, legislation and jurisdiction. Thus American military bases may be established and armed forces may be stationed within the Trust Territory in order to ensure the maintenance of international peace and security. In accepting responsibility for the Trusteeship the United States has obligated itself to promote the political, economic, social and educational advancement of the inhabitants.

Some of the administrative problems are inherent in the geographic complex of the Trust Territory while others stem from the superimposition of a western culture on Micronesian communities. The same geographic problems that confronted the Navy will face the Department of the Interior. The 96 island groups comprising 687 square miles of land scattered over the 3,000,000 square mile area will remain as isolated as ever. The problems of an enervating climate, of mold, rust, deterioriation, soil impoverishment and a galaxy of snails, scales, beetles and similar pests will continue to harass the indigenes in their attempts to eke out a subsistence. The sparsity of natural resources, the uncertainty of marketing facilities, and the shortage of available trade goods will discourage commercial activities except for, perhaps, copra production.

Yet the Administering Authority, whether it is the Navy Department or the Interior Department, must carry the Trust Territory towards the realization of its four-fold goal; political, economic, social and educational advancement. The eyes of a watchful world are focused on this experiment of administering a dependent people under the Trusteeship Agreement.

FRIDAY AFTERNOON SESSION, JUNE 22

Transport in the Algerian Sahara. BENJAMIN E. THOMAS, University of California, Los Angeles. Published in full in this issue.

The Northernmost Spanish Frontier in California as Evidenced by the Distribution of Geographic Names. HALLOCK F. RAUP, Kent State University.

Abstract: Within the bounds of the State of California the two cultures having the most pronounced influence have been the Spanish-Mexican and the English-American. One tangible evidence of this is apparent in the present-day distribution of Spanish and English geographical names within the state. Since California was first investigated by sea and by the Spaniards, the most ancient geographical names are of Spanish origin and are located at the more prominent points along the coast. Later during their land explorations the Spaniards added many names to a broad zone of coast northward to the San Francisco Bay area. Following the Gold Rush, Americans retained many of the Spanish names and added others of English origin. The zone of contact between the cultures therefore is marked on the map as the weak northern frontier zone that formed the northern limit of Spanish-Mexican settlements, and the evidence of this zone appears in the intermingling of Spanish and English geographical names, with a limit beyond which Spanish names are not used in any large numbers. This paper is being published in full during 1951 by the California Historical Society Quarterly.

Cartography and the Teaching of Relief Representation. JOHN C. SHERMAN, University of Washington. No Abstract received.

Successive Occupance of the Taos Valley, New Mexico. DAVID W. LANTIS, University of Southern California.

Abstract: New Mexico's minute Taos Valley is a principal center within the Rio Grande Depression, most populous sub-region of the Southern Rockies. Present inhabitants include the Tao Indians, Spanish-speaking Taosenos, and English-speaking Anglo-Americans.

Although traversed by "early man," first permanent occupancy is ascribed to the Tao, who migrated from the Colorado Plateau before 1540. This well-watered valley proved ideal for their dual hunting-farming economy, with squash, corn, and beans the chief irrigated crops. San Geronimo de Taos is the oldest continuously-occupied multi-story pueblo in the Southwest.

Don Fernando de Taos, established in the early seventeenth century, became a northernmost Spanish settlement. Its settlers reclaimed land not tilled by the Tao, and depended upon sheep and irrigated crops for a livelihood. By the nineteenth century, the valley had become the home range of some of the nation's largest flocks. Anglo-American fur-traders were outfitted at the village, but after the railroad by-passed the community, it experienced oblivion. Highway construction since 1925 has made travel possible and has turned the valley into a tourist center and a well-known art colony. With ever-increasing population, however, the lot of the Tao and the Taoseno farmers has been deteriorating for a century, so that critical social and economic problems face the valley.

The Papago Development Program, An Example of Land Use Planning. ANDREW W. WILSON, University of Arizona.

Abstract: The Papago Development Program is an attempt to readjust the relationship to their land of the Papago Tribe of Southern Arizona. It includes closely interrelated economic and social programs developed by the Tribal Council with the consent and advice of the Papago people and the Indian Service technicians. To carry out the program the Tribal Council is asking $23 million from the U. S. Congress, of which $12.5 million is for economic development, $9.5 million for social development (including education), and $1 million for a revolving credit fund to help families activate new enterprises.

The program contemplates eventually distributing the 1200 family population of 1949 as follows: one-third will raise cattle on the reservation; one-third will be trained to farm irrigated lands on the reservation; and the final third, plus the 2 per cent annual increase, will be trained to make a living away from the reservation (as 150 families already are doing).

It appears to be vital that the program be carried out as a whole since it would be of little value to make the physical improvements unless the pressure on the land is reduced to a reasonable level through the education of the people in new methods and the reduction in the numbers dependent upon the reservation lands.

Techniques in the Compilation of a Cartobibliography and the Uses of Such Data. EDWARD L. CHAPIN, JR., University of California, Los Angeles.

Abstract: Recognizing the utility to a geographer of an organized list of maps available for the study of an area, the motive was clear concerning

the necessity for developing techniques by which data could be obtained from maps and by which this information could be presented in a simple, concise and accurate form.

To accomplish this aim involved many problems: where were maps available for consultation; what practical form should be used for gathering the desired data; what were to be the bases for the selection of maps and what final form was to be used for presenting the map data?

These problems were solved through consultation with professional map users, through reference to published works and by trial runs using the map collection of the U. C. L. A. Department of Geography, and also through the development of three devised forms: Address Card, Cartobibliography Card, and an Outline Form for Map Entries.

The result is a cartobibliography, the selection of which was based on the criteria of date, subject matter, areal map coverage, and usefulness. The 624 maps listed, selected from over 1500 maps investigated, were grouped in categories of a physical and cultural nature with further arrangement within each category based on the factors of area coverage and date.

Each map was also placed within one of twelve areal divisions: California, Southern California, or one of the ten constituent counties of Southern California. A selected series of Index Maps was also compiled as an aid in ascertaining whether a particular area was covered by the type of map indexed.

It has been reasonably well established that such a cartobibliography can be of use to individual research workers as well as to the many government and private organizations whose problems involve the use and interpretation of maps.

A Preliminary Report on the Geography of Lake Chapala and the Possibility of Its Being the Site of Late Pleistocene Man. R. B. PETERS, Laguna Beach, California.

Abstract: Lake Chapala, Jalisco, Mexico, is a shallow lake at 5000 feet elevation, covering some 650 square miles which possibly occupies an old land surface, the Mesa de Anáhuac. It is confined by "levees" of recent and older lava flows. The lake is fed by the Larma River and the Rio Grande de Santiago drains Lake Chapala into the Pacific. Climatically this region of wet summers and dry winters is a pleasant one in which to live. The shores of the lake are occupied by old colonial pueblos of considerable size in which a typical Mexican population of Creoles, Mestizos and Indians now live. The lake now is at its lowest in historical times, exposing small islands possibly caused originally by thrust faulting in otherwise flat tufa beds making up this part of the lake floor. On these islands fossils are found in the few inches of mud covering the tufa beds. These large fossil bones are of Camelops hesternus, two species of horses, elephant, peccary, ground sloth and Hydrochoernus magnua (capybara). Many bones are broken and the fractures are little abrazed. A suggested hypothesis for the strange association of fossil bones in the mud of Lake Chapala is that this may have been an industry or camp site of a late Pleistocene Man which was later covered by water during the prehistoric period.

The Application of the Concept of Optimum to the Size of the City. WILLIAM L. GARRISON, University of Washington.

Abstract: An investigation of the applicability of the concept of optimum to the size of the city is reported in this study. Considerations include the theoretical aspects of this problem, an evaluation of related research, and a suggested method of size evaluation.

The problem at the theoretical level is the selection and evaluation of the city functions and criteria by which the city is at optimum size. A single function and criterion analysis would present a specific but meaningless solution. A multiple function and criteria analysis should present a meaningful solution, indeterminate over a wide range. Related research neither proves nor denies the applicability of the concept of optimum to the size of the city.

A technique approach to the problem is the use of averaged means. The data of variable criteria are averaged by city size categories. The means for each criterion are ranked by the city size categories. An average mean for each size category is then computed. The solution is the empirical order of these final average means.

A test of the adaptability of the concept of optimum to the size of the city could be executed using this technique. Research expenses would possibly amount to about $20,000 -- a small price for the placing of urban development on an empirical footing.

SATURDAY FIELD EXCURSIONS, JUNE 23

Two field excursions were arranged. One group, led by Richard F. Logan, visited the Santa Monica Mountains and the related coastal zone. The second group, led by James Wilson, spent the day at Los Angeles Harbor.

ABRIDGED REPORT OF THE SECRETARY - TREASURER

June 23, 1951

As of June 1, 1951, there were 184 Association members. This represents a small decrease over the total for 1950, but of the total only 84 were regular members with dues fully paid up, fewer than were paid up in June of 1950. Of the student membership, included in the above total, all 21 were paid up members.

Two Newsletters were distributed during the year.

At the business meeting on June 22, Dr. Howard Martin reported for the Association's Affiliations Committee, and Dr. Preston E. James spoke for the Association of American Geographers concerning the long-pending question of affiliation of the Association of Pacific Coast Geographers with the Association of American Geographers. Past differences no longer seemed impossible of solution and the meeting voted to submit the question to a vote of the full membership by mail ballot, accompanied by suitable explanation of the proposition.

Income Deposits		Withdrawals of Funds	
Opening Balance May 31, 1950	$691.18	Typing MS Yearbook Vol. 11	$ 20.00
Royalties	82.50	Printing Yearbook Vol. 11	491.62
Dues	312.00	Mailing materials	12.50
Yearbook Sales	49.00	Stamps, postcards, express charges	36.00
Balance of Fresno account	10.00	Typing MS Yearbook Vol. 12	21.00
Gifts	7.00	Total Withdrawals	$581.12
Total Deposits	$1151.68	Bank Balance May 31, 1951	570.56

Just subsequent to the above report final payments were made on the printing for the Yearbook, Vol. 12, amounting to $362.23, leaving an effective balance of funds for the next operating year of $208.33.

STATEMENT BY THE YEARBOOK EDITOR

Editorial error in compiling the financial statement included in Vol. 12 of the Yearbook gave printing charges for Vol. 11 as $473.67. This was the charge for Vol. 10 which, when added to the cost of plates, equals the figure given in the report on page 44 of Vol. 11. Proper listing of charges for Vol. 11 is given in the report printed above.

OFFICERS, 1951-52

President, Samuel N. Dicken, University of Oregon, Eugene.

Vice-President, Robert M. Glendinning, University of California, Los Angeles.

Secretary-Treasurer, Francis J. Schadegg, Eastern Washington College of Education, Cheney.

Editor, J. E. Spencer, University of California, Los Angeles.